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DIPLATERATOLOGY.

AN ESSAY ON

COMPOUND HUMAN MONSTERS,

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COMPRISING THE

HISTORY, LITERATURE, CLASSIFICATION, DESCRIPTION, AND EMBRYOLOGY

OF

DOUBLE AND TRIPLE FORMATION;

INCLUDING

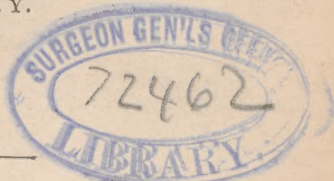
PARASITIC MONSTERS, FÆTUS IN FÆTU,

AND

SUPERNUMERARY DEVELOPMENT.

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Late Vice-President of the N. Y. State Med. Soc.; Mem. of the Am. Med. Assoc.;
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Historical Soc., Etc.



“*Multiformes pluribus modis inter Monstra partus edunter.*”—PLINY.

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DIPLOTERATOLOGY.



CLASSIFICATION AND NOMENCLATURE.

Teratology may now be regarded as a distinct branch of science.

It is characterised by special and peculiar facts, and regulated by laws, which, though intimately connected with, are yet more or less distinct from, those which preside over normal embryology, physiology, or pathological anatomy, and therefore as much entitled to the rank of a special branch of science as either of those just mentioned.

It embraces the consideration of a multitude of objects and conditions ranging almost from "zero to innumerable." The multiform varieties which are found in the entire series of abnormal and monstrous formation which occur in man and the lower orders of animals, would bewilder the student were it not possible to classify them according to some rational method; hence we find that numerous writers have attempted various systems of arrangement, as will be seen in the synopsis of a portion of them, at the close of this section.

The writer maintains that a scientific system of nomenclature and classification, based on distinctions of conformation and structural peculiarities, can be made for this, as well as for many other branches of classified science.

Classes, orders, genera, and species can be defined and established on distinctive characteristics, particularly with duplex formations, which are nearly as definite and constant as are required by modern naturalists in zoological and botanical classifications.

There are certain well marked teratological forms, which may be regarded as types, that have occurred among the lower animals, in common with man, without regard to species, nation, geographical location, or time, and which have been reproduced again and again, with modifications so trivial as to leave but little doubt in the mind of the student as to the order or genus to which any given form is referable.

Yet it has been maintained by some writers of considerable authority, that duplex formations will not admit of scientific classification, in consequence, as it is alleged, of the fact that compound monsters and supernumerary formations, when taken collectively, form one class of organic beings, which can be arranged in a continued series, from the lower degrees of duplicity, in which the excess of development is manifested in the multiplication of unimportant parts—for example, a supernumerary finger

or toe—to the opposite and final end of the series, in which the maximum of duplicate development results in the production of two complete and symmetrical individuals, connected at some point by a small bond of union, for example, such as is seen in the case of the noted Siamese brothers. Another objection or obstacle to be encountered in an attempt to classify double monsters, arises from the fact that, to a certain extent, there is a want of conformity or of constant relation between the external configuration and the internal structure in the several forms of compound monsters.

In view of these considerations, it has been regarded impracticable to construct a classification founded on permanent distinctive characteristics. The late Prof. W. Vrolik of Amsterdam entertained this view of the subject, and hence we find in his treatise on Double Monsters no further attempt at classification, than a mere grouping of closely allied forms under the simple heads of "Anterior junction," "Posterior junction," "Lateral junction," etc. It is true, that in an extended series of cases of compound monsters embraced by the extremes above indicated, the intermediate forms, to a limited extent, merge into each other by such almost imperceptible degrees as to render it quite difficult, in some instances, to fix with precision the limit of a genus or species; yet the same embarrassment is encountered in other departments of natural science giving rise to a great diversity of opinions among authors, who *erect* new genera and species to suit their convenience, and, to meet the minor distinctions, create an indefinite number of *sub-genera*, *sub-species*, and *varieties*.

The grand objection to a strictly scientific classification of compound monsters is found in the fact that they cannot be continued by natural propagation.

While it is not in our power, in the present state of knowledge concerning the embryology or genesis of duplex development, to make a classification in strict conformity with the scientific principles required in botanical and zoological systems; yet it cannot be denied that there are certain well determined facts, constant and definite characters, upon which, orders, genera, and species may be founded, each of which is represented by a typical form, that may be regarded as the center of a natural group.

I will here briefly premise in regard to the genesis of double monsters, that they are not the result of an accidental coalition of twins, at some uncertain period of their embryonic development; neither do they result from a double egg—that is to say, an egg containing two yolks enclosed in one capsule; they are invariably the product of a single ovum, with a single vitellus and vitelline membrane, upon which a double cicatricula, or two primitive traces are developed.

The several forms of double malformation, the degree of duplicity, the character and extent of the fusion, all result from the proximity and relative positions of the neural axes of two more or less complete primitive traces developed on the vitelline membrane of a single ovum.

This is not a theoretical opinion, it is an established fact, determined by direct and repeated observations and researches instituted by different embryologists. It furnishes a satisfactory explanation of the several laws which have been discovered to preside over the development of double

monsters, viz.: the law of homologous union, the law of unity of sex, and the less certainly determined law of transposition of viscera.

Homologous union, and unity of sex, in duplex formations, are positive laws. I may be premature in declaring the transposition of viscera, which has been observed in so many cases, to constitute a law. Many cases are so imperfectly reported, as not to mention the relative positions of the thoracic and abdominal viscera. In numerous instances, however, the fact has been noted, that the axes of the two hearts of a double monster converge at the apices, on the median line of coalescence of the two bodies; the same is true of the livers, spleens and stomachs; in short, all the unsymmetrical viscera of a single individual are, in these cases, symmetrically developed and disposed, in relation to the common median axis of the compound body. In another section of this monograph, this subject will be discussed more in detail.

An attentive observation of the mode of conjunction, in all the varieties of composite monsters, demonstrates the practicability and propriety of a threefold division, corresponding with duplicity and more or less separation existing, first, at the superior, secondly, at the inferior extremity [anterior and posterior in animals] of the cerebro-spinal axis; and thirdly, with duplicity and separation existing coincidently at both extremities of the vertebral axis.

The division of compound monsters into three primary groups, or orders, coincides with the earliest development of double embryos, according to the observations of all who have been so fortunate as to have opportunities of making researches at early embryonic periods.

The following appropriate names have been given to the three cardinal groups above indicated:

ORDER I.—*Terata catadidyma*. Derived from *τέρας*, *τέρατος*, 'a monster,' and *κατά*, 'down,' and *δίδυμος*, 'a twin.'

Definition.—Duplicity, with more or less separation, of the cerebro-spinal axis from above downward.

ORDER II.—*Terata anadidyma*. Derived from *ανά*, 'up,' or 'above,' and *δίδυμος*, 'a twin.'

Def.—Duplicity, with more or less separation of the cerebro-spinal axis from below upward, or from the caudal towards the cephalic extremity of the neural axis.

ORDER III.—*Terata anacatadidyma*. Derived from *ανά*, 'above,' and *κατά*, 'down,' and *δίδυμος*, 'a twin.'

Def.—Duplicity, with more or less separation, of both the cephalic and the caudal extremities of the cerebro-spinal axis, existing contemporaneously.

Each of the above orders embraces several well marked forms, which are sufficiently characterized to be placed in the relation of genera, which genera will admit of further subdivision into well defined specific groups.

In defining each order, genus and species of compound monsters, the maximum or *plus* development is taken as the *type*, which is followed, in the history and description of cases, by the lower or *minus* proportionals of the division under consideration, arranged in a descending scale.

This plan is different from any arrangement with which I am acquainted, being quite the opposite of that adopted by most modern teratologists. It is founded on an extensive and careful examination of all the known degrees of duplicate development, with a view to discover the maximum duplex formation attainable in each order, genus or species, which is to constitute its distinguishing type. The inferior degrees or minus quantities are arranged in a descending series, according to their departure from the classical type.

By this method the true relations and analogies of apparently dissimilar forms will be more readily recognized and comprehended. On the other hand, it widely separates apparently analogous varieties, which, in previous classifications, have stood in close relation to each other.

The types consist, in most instances, of two individuals symmetrically developed, and united by obvious homologous fusion. In the unsymmetrical forms, one individual is well developed; the other, in consequence of arrest or retardation of the formative process, is more or less defective in size, or deficient by the absence of parts. All such cases have heretofore been denominated heteradelphic and parasitic monsters. In some of the so-called parasitic monsters, the law of homologous union is apparently deviated from: for example, where a head, or pair of extremities, with or without some portion of the body, is found attached to the epigastrium of a well developed individual, it is not a contradiction of this law; the union was symmetrical and homologous at an early stage of embryonic development; subsequently, the formative process in one became arrested or retarded, while it continued active in the other portion, thus giving rise to unequal development. If the arrest of development in one portion of a double embryo, occurs at a period prior to the evolution of the extremities, or many of the internal organs, while the other portion of the compound embryo continues its normal development, the arrested rudiments may be so far enveloped by the well formed individual as to appear in the form of an amorphous mass, containing more or less foetal rudiments. Cases of this kind have been denominated *fœtus in fœtu*, "fœtus by inclusion," etc.

The classification adopted in this monograph arranges the so-called "heteradelphs," "parasitic monsters," and "fœtus in fœtu," according to their relative situation or attachment to the principal body, and their correspondence to the various generic types, to which they are believed to belong, differing, not in *kind*, but merely in *quantity*.

This view of the relation of parasitic monsters, and fœtus in fœtu, to the higher degrees of duplex formation, receives strong support from the fact that some cases of the latter make a transition towards the former, and that the parasitic varieties unquestionably pass through a series of intermediate gradations to the more complete and symmetrical types of double monsters.

Supernumerary formation of unimportant parts of an otherwise well developed single body will be but briefly treated of in this essay.

M. Isidore Geoffroy St. Hilaire has very clearly defined the distinction between simple and compound monsters. Compound monsters are those in which the elements of two or more subjects, either complete or incomplete, are united.

In simple monsters by excess, the supernumerary part is not important; it is not an organ or apparatus, but a part of one, a mere numerical augmentation. It may arise, first, from the division of a single into two portions; secondly, from a considerable growth of parts, which in the normal state are mere rudiments; or thirdly, the production of one or more organs which are really supernumerary. In the latter case, they are very unimportant organs, and those which have numerous homologous parts in the normal type, and which are observed to be most liable to undergo variations in number, in the series of lower animals.

In composite monsters, on the other hand, there is, in the most simple cases, an increase in the number of apparatuses, not by a scission or growth of parts, but by the existence of parts really superadded to those which compose an individual; they never take a place among the apparatuses of the subject that presents them supernumerarily; they have a peculiar and distinct existence. In simple monsters, they are blended in the organization of the subject that presents it. They are both anatomically and physiologically distinct.

The following very excellent remarks of Allen Thompson,* on the distinction of double from single monsters with redundant or supernumerary formation, are more nearly in accordance with the state of our knowledge concerning embryology and diploteratology.

"It seems to me more consistent with the observed facts to consider as the double malformations only those instances in which the parts of two cerebro-spinal axes, or of two vertebral columns, are present; for I am inclined to think that there is no well authenticated instance upon record of the existence of the double condition of any important organ, in which there is not reason to believe that some degree of duplicity, it may be slight, has also existed in the cerebro-spinal system. In proof of this, I may cite the example of one of the lowest degrees of double malformation of the face, described as occurring in a lamb, by Gurlt, in which there existed a double tongue, an approach to a double lower jaw, and a cleft palate, as the most obvious malformations. No duplicity of the cerebro-spinal axis was visible externally, but a careful dissection showed internally a commencing double condition of the bones at the base of the skull, an additional pair of corpora quadrigemina, double pineal gland, pituitary body, &c. But for the careful dissection made by Gurlt, this case might have been described as an example merely of double tongue and jaw."

Dr. A. Thompson suggests the separation of mere redundant or supernumerary malformations, from the true double monsters, in all future classifications, whereby we shall raise the latter to the rank of a distinct class.

The double monsters should be restricted to the combination of two individuals, whether consisting in the union, by a limited portion of their bodies, which may be equally or unequally developed; or lastly, in the smallest degree of double malformation, in which there are no more than traces of an additional cerebro-spinal axis, or parts which appear to have been connected therewith.

I do not urge that a perfectly satisfactory classification can be made.

* "Remarks upon the early condition and probable origin of Double Monsters." London & Edinburgh Monthly Jr. of Med. Science. Vol. IV, p. 481, 1844.

There are series of intermediate forms between the types of the larger groups, which, by their various modes and degrees of coalescence, and the extent of their development, approach singleness on one hand, and complete duality on the other.

A cursory, or even a critical comparison of all the known cases of double malformation, exhibits the fact that most of the intermediate or transitional forms are extremely rare, whereas the cases in close relation to the principal types are quite numerous, and so nearly identical, in external configuration and internal structure, as to lead the common observer to include them in the same generic and specific groups to which they would be referred by the scientific teratologist. The difference in the individuals of a group is not greater than naturalists occasionally admit under the technical term *varieties*.

To say the least of the more recent attempts to classify compound monsters, such, for example, as is here proposed, they are believed to be something more than mere artificial and arbitrary arrangements, and to possess the merit of being founded upon rational distinctions of tolerable constancy, and, moreover, they will serve greatly to facilitate and simplify the study and comprehension of the subject, and aid in the future description of cases, which are the chief desiderata to be attained in all classical systems.

The writer has not aimed at originality in the classification adopted in this essay; it is the result of modifications of systems previously existing, which have, however, in many particulars, been so far recast as to have nearly or quite lost their distinguishing features.

I have avoided innovation in nomenclature as far as possible, selecting from the existing vocabulary, with occasional alterations or additions, rather than, by the multiplication of technical terms, increase the embarrassment, which is by no means inconsiderable, in consequence of the large number of synonyms, or equivalent terms, with which the study is already burdened.

No little care has been taken to give the synonyms, and, as far as practicable, the authority for the same.

The term *synonym* will be employed in an extended sense, not merely indicating identity of signification, but frequently made to embrace terms, which, though of different etymology, are used to designate the same object, and hence to be regarded as equivalents. In most instances I have given as synonyms different generic and specific names, proposed by various authors, which either correspond to or are included within the limits of the genus or species under consideration.

The etymology and definition of the terms pertaining to diploteratology, which are employed in this treatise, have also been given in most instances.

Having thus far premised the general principles upon which a plan of classification is to be founded, I now propose presenting a few additional details concerning the subdivision of the three cardinal orders before designated.

The first order, *Terata catadidyma*, in which the cerebro-spinal axis exhibits more or less duplicity, with separation at the cephalic pole, embraces four groups, which are so distinctive and peculiar, that they may with pro-

priety stand in the relation of genera. Following the order of development, from the higher to the lower degrees, we have:

Genus I.—PYGOPAGUS. *Derivation.*—From *πυγη*, 'the nates,' and *πάγω*, 'I fasten.'

Definition.—Two individuals more or less complete, separated as low as the pelvis, by the lateral or posterior portions of which they are united; genitals double. In the higher degrees there are two umbilical cords, which are normally attached, respectively, to each abdomen. Vital organs independent in the *type*.

Genus II.—ISCHIOFAGUS. *Der.* from *ίσχω*, 'I arrest' or *ισχίον*, 'the haunch,' and *πάγω* 'I fasten.'

Definition.—Two more or less complete individuals, whose pelves are united so as to form a common ring or basin; the right pubic bone of one individual forms a junction with the left of the other individual, and *vice versa* on the opposite side; the symphyses pubes are at right angles to the vertebral axis, which is common to both, the cephalic poles being opposite; common abdomen, single umbilicus and funis; two sets of genitals, four pelvic and four pectoral extremities. In the *type* the vital organs are independent.

Genus III.—DICEPHALUS. *Der.* from *δι*, 'double,' or *δισ*, 'twice,' and *κεφαλή*, 'head.'

Definition.—Two individuals more or less complete, with two distinct and separate heads; the vertebral axis of the bodies more or less parallel, or converging from above downward; the coalition of the bodies, the number of the extremities, and the condition of the viscera vary in the several species; genitals single; one umbilicus, and one funis.

Genus IV.—DIPROSOPUS. *Der.* from *δι*, *δισ*, 'double,' 'two,' and *προσωπον*, 'countenance' or 'face.'

Definition.—An apparently single body, two pelvic and two thoracic extremities. Two heads more or less fused, the compound head having two faces, the axes of which vary in their relations to each other, in the different species. The species are founded on the existing number of ears and eyes which are developed; single set of genitals; single umbilicus and funis.

The second order, *Terata anadidyma*, in which the cerebro-spinal axis is more or less duplicated and separated from the caudal towards the cephalic pole, is divisible into three generic groups, viz:

Genus I.—CEPHALOPAGUS. *Der.* from *κεφαλή*, 'head,' and *παγω*, 'I fasten.'

Definition.—Two more or less complete individuals, conjoined by some portion of their heads; the bodies are distinct and free, with all their members and organs well developed. In the typical cases the vital organs are independent, and each individual has an umbilicus and single funis.

In the unsymmetrical forms the parasitic body or part receives its nutrition through the vascular communication with the well formed body, which alone is supplied with a funis. This genus is divisible into two species only, viz: *Craniodidymus* and *Prosopodidymus*. The former includes those cases in which the junction is by the crania, the latter those in which the coalition is by any portion of the faces.

Genus II.—SYNCEPHALUS. *Der.* from *συν*, 'with,' 'together,' and *κεφαλή*, 'head.'

Definition.—In the typical form of this genus, all the parts of two individuals are developed, but the anterior portions of the bodies do not occupy their normal relative positions. The bilateral halves of each body, from the umbilicus to the vertex, instead of meeting on the anterior median line of the body, are separated so widely that each body forms one-half of a cylinder, which is completed by the other, the coalition being found at right and left lateral median lines. The compound head has two faces, looking, Janus like, in opposite directions, situated laterally in relation to the vertebral columns. Each individual contributes one-half of each face, the right side of one joins the left of the other on one side of the lateral median line of fusion, and *vice versa* with regard to the other compound face. The same arrangement exists in the thorax, which is one great cavity, surrounded by two opposite vertebral columns, two opposite sternums, and forty-eight ribs. The right half of the sternum and its accompanying ribs of one body, unite at the lateral median line with the same parts from the left of the other body, which arrangement also exists on the opposite side of the compound thorax. The abdomens, as low as the umbilicus, are fused in the same manner, the parts below which are separate and normal. Single umbilicus and funis. In the unsymmetrical *Syncephalus*, one of the lateral faces is well developed, the opposite being more or less defective, through a series of degrees, until all traces of facial organs are wanting. A deficiency, though to a somewhat less extent, is seen in the corresponding portions of the body.

Genus III.—DIPYGUS. *Der.* from $\delta\iota$, 'double,' and $\pi\upsilon\gamma\eta$, 'nates.'

Definition.—The duplicity exists in the caudal extremity of the neural axis, and the adjacent parts. The vertebral column may be duplicated throughout a great portion of its length, or in so slight a degree as to exhibit mere traces of duality in its sacral or coccygeal portions. Corresponding with the extent of duplex development in the vertebral axis, will be the duplicity of the pelvic viscera and extremities, the external genitals, etc. The funis and umbilicus are single. The parts above the umbilicus are also single and apparently normal.

The third order, *terata anacatadidyma*, in which the duplicity with separation occurs, coincidently, at both extremities of the cerebro-spinal axis, will be divided into two generic groups, viz.: I. Those in which the individuals are conjoined at the umbilicus, which is always single, the fusion involving more or less of the anterior portions of the bodies, above the navel. II. Those in which the individuals are fused at some portion of the vertebral columns, with separation above and below the coherent parts.

Genus I.—OMPHALOPAGUS. *Der.* from $\sigma\mu\phi\alpha\lambda\omicron\varsigma$, 'the navel,' and $\pi\alpha\gamma\omega$, 'I fasten.'

Def.—In the maximum degree, or typical form of this genus, two symmetrical and well developed individuals are connected by a very small band arising from the middle and anterior region of the bodies, which are situated more or less sidewise in relation to each other. The umbilicus is found in the middle and lower part of this bond of union, which, in the foetal condition, receives a single funis, through which both individuals are supplied with blood.*

* The Siamese brothers furnish one of the best illustrations of this type.

In the less distinct forms of this genus, the extent of the coalescence varies in the several species, from the small band above mentioned, to a fusion of the whole anterior portions of the bodies, from the abdomen to the mouths, in the latter instance approaching the syncephalus.

The genus *Omphalopagus* is divided into several species, distinguished by the character and extent of the fusion. In the highest degree, in which the extremities of the ziphoid cartilages are contiguous, and form the principal substance of the bond of union, it may be denominated *O. ziphodidymus*. For the second species, involving more or less of the sternum in the coalescence, I propose the term, *O. sternodidymus*. A third species is founded on fusion of the entire thoracic parieties—*O. thoracodidymus*. When the fusion extends as high as the face, a fourth species is made under the designation *O. prosopodidymus*. In the fifth and last species, in which a considerable portion of the abdomens is included in the conjunction, the term *O. gastrodidymus*, will be employed.

If it should be thought advisable to make the nomenclature more explicit, and the classification more minute, in cases where the abdomens, as well as the ziphoid cartilages, the sterna, the thoraces, or the faces enter into the fusion, the word *gastro* may be prefixed to the other terms, e. g., *Omphalopagus*, *gastro-ziphodidymus*, *O. gastro-sternodidymus*, etc., etc.

For the sake of brevity, in describing or referring to a particular species, the generic term may be omitted, employing the specific name only, which will admit of modification without violence, thus, *Ziphodidymus*, *Ziphodymia*, or *Ziphopagus*; *Gastro-ziphodidymus*, *Gastro-sternodidymus*, etc.

Genus II.—*RACHIPAGUS*. *Der.* from *ράχις*, 'the spine,' and *παγω*, 'I fasten.'

Def.—Two individuals, more or less developed, united by some portion of their vertebral columns, with separation above and below the limit of fusion.

The cases which belong to this genus are so rare, and exhibit so little variety, that subdivisions are considered impracticable and unnecessary.

The above classification is intended to include all the varieties of compound monsters. The numerous cases of redundant and supernumerary formation occurring in single individuals, in which no duplicity is to be discovered in the cerebro-spinal axis, will be briefly treated in a separate section, under the general term *POLYMERIA*, from *πολvs*, 'many,' and *μερος*, 'a part,' which will include the consideration of supernumerary organs.

Polymelia, from *πολvs*, 'many,' and *μελος*, 'a limb,' which embraces an account of duplicate extremities, may be subdivided into three species, viz.: 1. *Polyscelia*, from *πολvs*, 'many,' and *σκελος*, 'a leg.' 2. *Polybrachia*, from *πολvs*, 'many,' and *βραχιων*, 'the arm.' 3. *Polydactylus*, from *πολvs*, 'many,' and *δακτυλος*, 'a finger;' the latter embracing all cases of supernumerary digits, occurring in either the hands or feet.

The following table exhibits a condensed view of the classification which will be followed in this monograph:

DUPLEX DEVELOPMENT.

a. COMPOUND MONSTERS.

CLASS I.—*Double Monsters*,

ORDER I.—CATADIDYMA.

Genus I.—Pyropagus.....	Sp. 1. Pyropagus symmetros.....	{ Var. 1. P. bicephalus. Var. 2. P. tetrapus. Var. 3. P. tripus. Var. 4. P. amorphus. Var. 1. P. subdermaticus. Var. 2. P. sacro-cysticus.
	Sp. 2. ————— disjunctus.....	
	Sp. 3. ————— conjunctus.....	
Genus II.—Ischiopagus....	Sp. 1. Ischiopagus symmetros.	
	Sp. 2. ————— tetrapus.	
	Sp. 3. ————— tripus.	
	Sp. 4. ————— dipus.	
	Sp. 5. ————— dipygus.....	{ Var. 1. Isch. dipygus tetrapus. Var. 2. ————— tripus.
Genus III.—Dicephalus....	Sp. 1. Dicephalus tetrabrachius tripus.	
	Sp. 2. ————— tetrabrachius dipus.	
	Sp. 3. ————— tribrachius tripus.	
	Sp. 4. ————— tribrachius dipus.	
	Sp. 5. ————— dibrachius.....	{ Var. 1. Diauchenos. Var. 2. Monauchenos.
Genus IV.—Diprosopus....	Sp. 1. Diprosopus tetrotus.	
	Sp. 2. ————— triotus.	
	Sp. 3. ————— tetrophthalmus.	
	Sp. 4. ————— triophthalmus.	
	Sp. 5. ————— diophthalmus.	

ORDER II.—ANADIDYMA.

Genus I.—Cephalopagus...	Sp. 1. Cephalopagus craniodidymus	{ Var. 1. Craniodidymus symmetros. Var. 2. ————— asymmetros.
	Sp. 2. ————— prosopodidymus. ..	{ Var. 1. Prosopodidymus symmetros. Var. 2. ————— asymmetros.
Genus II.—Syncephalus ...	Sp. 1. Syncephalus Janus.....	{ Var. 1. Janus equalis. Var. 2. ————— inequalis.
	Sp. 2. ————— monoprosoopus.	
	Sp. 3. ————— aprosoopus.	
Genus III.—Dipygus	Sp. 1. Dipygus tetrapus.	
	Sp. 2. ————— tripus.	

ORDER III.—ANACATADIDYMA.

Genus I.—Omphalopagus..	Sp. 1. Omphalopagus ziphodidymus.	
	Sp. 2. ————— sternodidymus.	
	Sp. 3. ————— thoracodidymus.	
	Sp. 4. ————— prosopodidymus.	
	Sp. 5. ————— gastrodidymus ...	{ Var. 1. Gastro-ziphodymia. Var. 2. ————— sternodymia. Var. 3. ————— thoracodymia. Var. 4. ————— prosopodymia.
Genus II.—Rachipagus...	Sp. 1. Rachipagus symmetros.	
	Sp. 2. ————— asymmetros.	

CLASS II.—*Triple Monsters*. *

b. SUPERNUMERARY FORMATION.

Genus I.—Polymeria.		
Genus II.—Polymelia.....	Sp. 1. Polyscelia	{ Var. 1. Polyceruria. Var. 2. Polypedia.
	Sp. 2. Polybrachia	{ Var. 1. Polybrachia. Var. 2. Polymania.
	Sp. 3. Polydactylus.....	{ Var. 1. Polydactylus pedis. Var. 2. ————— manus.

In conclusion, I will give a brief summary of several systems of classification which have been proposed by some of the most celebrated authors on teratology.

So numerous and varied were the forms of abnormal development and monstrosity which had been occasionally observed in man and animals, that the necessity of some system of nomenclature and classification was early perceived ; accordingly, the older writers attempted different arrangements,

* Only two or three authentic cases are known. These and all others that may occur in future can be arranged under the same genera and species as double monsters, with the use of the prefix Tri. e. g. *Tricephalus*, *Triprosopus*, etc.

which, however, were too crude and unscientific to merit the title of classifications. Many of the names which they employed were derived from vague and incorrect notions in regard to their origin, or from fancied resemblances to objects, real or imaginary. A few examples of the numerous divisions and arrangements of monsters adopted by the early writers are given below, in order to show the extremely crude state of knowledge which prevailed in the seventeenth and eighteenth centuries, in reference to this subject.

The classification of compound monsters adopted by some modern teratologists is also here presented.

It is interesting to observe the progressive improvement in knowledge, as indicated by the classifications which have been invented, from time to time, in the history of the subject.

The earliest which I shall notice is from Licetus, [A. D. 1616,] in which all monsters are arranged in two great classes, viz., "uniform" and "multiform."

I. UNIFORM MONSTERS. Possessing parts belonging to one sex of a human being; it embraces six divisions :*

- a. *Mutilated*, e. g., without legs or arms.
- b. *Excessive*, " as a double-headed girl.
- c. *Doubtful*, " as two headed, without legs.
- d. *Deformed*, " as eyes in the breast, hand on the neck, testicles in the belly, &c.
- e. *Unformed*, " shapeless or round.
- f. *Enormous*, " as a half stone child.

II. MULTIFORM MONSTERS. Possessing parts belonging to different species or sexes, for example :

A woman with a man's head.

A child which is half dog.

A Centaur, a Minotaur, &c.

A boy with the feet of a goose; with wings, with the head of a frog.

And finally, the *Semi-demon*, consisting of several species.

Huber [*Observationes atque cogitationes nonnullæ de Monstris. Cassel, 1748,*] arranges all deformations and monsters under nine heads, viz. :

1. Supernumerary parts.
2. Deficiency of several parts, or of one important part.
3. Existence of parts belonging to different kinds of animals in one being, e. g., body and extremities of a pig, and the head of a dog.
4. Well formed human bodies, with parts belonging to animals, e. g., the ears of a hare, or a tail.
5. Transposition, or malposition of organs.
6. Closure or fusion of parts naturally open or free, e. g., closure of the anus, or fusion of toes and fingers.
7. Normal single body, with multiplicity of unimportant parts, e. g., six fingers on one hand, &c.
8. Bad proportion, as when one member is smaller than the other.
9. Overgrowth, and dwarf-development of the body.

* The terms and descriptions are given in literal translation.

Buffon [*Hist. Naturelle. Supplem. IV., p. 578, A. D. 1800.*] divided malformations into three classes, which have constituted the basis of classification adopted by most subsequent writers in their variously modified systems, on which account it is particularly worthy of mention.

1. Malformation with excess. 2. Malformation with deficiency. 3. Malformation with inversion, or perverse site.

Malacarne [*Dei nostri umani, etc. Memor. della societ. Ital. Vol. IX, 1802.*] makes sixteen classes of what he calls monsters, viz :

- I. *Microsomia*.—Extraordinary smallness of the whole body.
- II. *Micromelia*, do do of a limb, or member.
- III. *Macrosomia*, do largeness of the whole body.
- IV. *Macromelia*, do do of a limb, or member.
- V. *Polyeschia*.—Monstrosity of the whole body.
- VI. *Eschomelia*.—Monstrosity of a limb or member.
- VII. *Atelia*.—Deficiency of a limb or member.
- VIII. *Metathesia*.—Transposition of members or organs.
- IX. *Polysomia*.—Multiplicity of the whole body.
- X. *Polymelia*.—Multiplicity of members.
- XI. *Androgynia*.—Human hermaphroditism.
- XII. *Diandria*.—Double male genitals.
- XIII. *Digynia*.—Double female generative organs.
- XIV. *Andralogomelia*.—Human body with animal members.
- XV. *Alogandromelia*.—Animal body with human members.
- XVI. *Aloghermaphroditia*.—Animal hermaphroditism.

Voigtel [*Handbuch der Patholog. Anatomie. Bd. 3, p. 574.*] classifies monsters under ten heads, viz :

1. Deficiency of one or several parts.
2. Multiplicity of parts.
3. Junction of two bodies.
4. Irregularity or malformation of single parts.
5. Irregularity or malformation of the whole body.
6. Transposition of viscera.
7. Unnatural tumors.
8. Separation of parts normally joined [clefts, &c.]
9. Closure of natural openings [atresia.]
10. Hernia.

J. F. Meckel [*Handbuch der Pathol. Anatomie, B. I. p. 44, A. D. 1812.*] adopted the following arrangement :

1. Malformation by deficient plastic power.
2. Malformation by excess of plastic power.
3. Malformation from deviation of the organs in respect to their natural form.

4. Malformation characterized by ambiguity of sex—hermaphroditism.

This distinction of hermaphroditism from other malformations constitutes the principal defect of Meckel's classification :

Blumenbach (*Handbuch der Naturgeschichte. Göttingen, 1825.*) made the following four classes :

1. *Fabrica aliena.* 2. *Situs mutatus.* 3. *Monstra per excessum.* 4. *Monstra per defectum.*

Bonnet [*Considérations sur les corps organisés*, p. 102.] adopts a classification almost identical with that of Blumenbach.

Breschet [*Diction. de Médecine. Art. Déviation organique*, A. D. 1829.] in his classification, divides Buffon's first class into two, by separating duplicate formations from malformations per excessum. Breschet's four orders are again divided into species—thus:

Order I. *AGENESIS*—devious formations, with diminution of plastic power. Four species.

a. *Ayénsie*—absence—defective development. It is either partial, as in hemicéphalie, aprosopie, acéphalie, apleurie; or it is general, as in microsomatie (dwarfishness, cretinism).

b. *Diastématie*—Cleft formation at the median line. It is subdivided, according as it affects the head or the trunk. Diastémencéphalie, &c., and Diastématasternie, &c.

c. *Atrésie*. d. *Symphysie*, coalition, fusion.

Order II. *HYPERGENESES*—with augmentation of plastic power. This order presents two species, according as the individual parts or the entire body are concerned. To the former species belong macrocéphalie, macroprosopie, &c. The latter consists of macrosomatie, [Giant growth].

Order III. *DIPLOGENESES*—devious formations with the fusion of germs—duplicate formations.

This order is divisible into *external*, through fusion or adhesion, as in Diplocéphalie, Diplothoracie; and *internal*, through penetration (per penetrationem).

Order IV. *HETEROGENESIS*—with alien character of the product of generation. It is divided into three species:

a. *Deviation as to site*, either of the entire organism [extra-uterine pregnancy], or of individual organs [ectopie].

b. *Deviation as to number*, Polypædie. The co-existence in the uterus of several fœtuses.

c. *Deviation as to color*. Leucopathie, Cyanopathie, Cirrhopathie.

Rokitansky remarks,* “In this arrangement, the distinction of diplogenesis from hypergenesis is based upon the improved doctrine of the fusion of two germs constituting duplicate formation. To the order heterogenesis, are referred deviations which ought not to be designated as malformations.”

Gurlt, [*Handbuch der Pathol. Anat.* A. D. 1832], a distinguished German teratologist, divides malformation into three classes—simple, double, and threefold:

I. *Monstra simplicia vel unicorporea*, malformation in one body, simple monstrosity. This he divides into seven orders, which I omit for the sake of brevity.

II. *Monstra duplicia vel bigemina*, double monstrosities. This class has two subdivisions:

A. Double malformations from coalition.

B. do do do implantation.

The first subdivision is broken into four orders:

* Pathological Anatomy, vol. 1, p. 15. Sydenham Soc., ed. 1855.

- a. Coalition without separation at either end of the body.
- b. Coalition with separation at the upper end of the body.
- c. Coalition with separation at the lower end of the body.
- d. Coalition with separation at both ends of the body.

III Monstra triplicia vel trigemina. Triple monstrosities. This class will admit of the same division into orders as the second class, should cases occur to require such a division.

Isidore Geoffroy St. Hilaire [*Hist. des Anomalies de l'organisation, etc.*, 1832-1837.] has contributed a very elaborate system of teratological nomenclature and classification. The portion relating to compound monsters will alone be alluded to in this connection.

Malformations are first divided into simple and complex—*anomalies simples et complexes*. The first are only slight anomalies, causing neither disturbance of function nor deformity; the second include monstrosities properly so called, implying more considerable deviations of organization, and consisting of a faulty anatomical arrangement, greatly deviating from the type of the species, externally visible, and obstructive of one or more functions. These are divided into two classes, viz: I. *Monstres unitaires*. II. *Monstres composés*. The latter class is again divided into two sub-classes, viz:

- 1. *Monstres doubles*. 2. *Monstres triples*.

The double monsters are divided into two orders:

Order I. *Monstres doubles Autositaires*, fusion of two more or less complete individuals.

Order II. *Monstres doubles Parisitaires*, union of an autosite with an omphalosite or parasite.

The first order is divided into three *tribes*.

The first of these tribes is again subdivided into two *families*:

Fam. I. Eusomphaliens—the union of two nearly perfect organisms, each possessed of a normal umbilicus and umbilical cord. This family contains three genera, as is shown in the annexed table.

Fam. II. Monomphaliens—the union of two organisms, having one umbilicus and funis in common; this family embraces five genera.

The second tribe also has two families:

Fam. I. Sycéphaliens—fusion of head and trunk; three genera.

Fam. II. Monocéphaliens—two trunks with one head; four genera.

The third tribe consists of two families:

Fam. I. Sysomiens—single trunk with double head; three genera.

Fam. II. Monosomiens—mere vestiges of duplicity about the head; three genera.

The second order [Double parasitic] comprehends three tribes. The first tribe has two families:

Fam. I. Hétérotypiens—parasite and autosite, united about the umbilical region; five genera.

Fam. II. Hétéraliens—parasitic head upon the vertex of the autosite; one genera.

The second tribe comprises two families:

Fam. I. Polygnathiens—imperfect head implanted in the maxillary apparatus of the individual; four genera.

Fam. II. Polyméliens—the parasite consisting solely of extremities and adjuncts; five genera.

The third tribe has but one family:

Famille unique, Endocymiens—a parasite enclosed within the autosite; (Fœtus in Fœtu) two genera.

The second class—Monstres triples—admits of the same divisions and subdivisions, with the same nomenclature by the mere use of the prefix *tri* or triple, e. g. triple autositic, triple parasitic, etc.

The work of Is. Geoff. St. Hilaire is perhaps more frequently referred to in this country than any other authority. I have therefore introduced his table of classification, as far as it relates to compound monsters.

The great errors of the classification of St. Hilaire consist in its purely artificial character, its want of harmony with the laws of Diplogenesis, and its being too elaborate and complicated for practical purposes:

ORDER I.—MONSTRES DOUBLES AUTOSITAIRES.

		Genres..
Tribu I.....	{	Pygopage.
		Métopage.
		Céphalopage.
		Ischiopage.
		Xiphopage.
	{	Sternopage.
		Ectopage.
		Hémipage.
		Janiceps.
		Iniopé.
Tribu II.....	{	Synote.
		Déradelphé.
		Thoradelphé.
		Iléadelphé.
		Synadelphé.
	{	Psodyme.
		Xiphodyme.
		Dérodyme.
		Atlodyme.
		Iniodyme.
Tribu III.....	{	Opodyme.
	{	

ORDER II.—MONSTRES DOUBLE PARASITAIRES.

Tribu I.....	{	Hétéropage.
		Hétérodelphé.
		Hétérodyme.
		Hétérotype.
		Hétéromorphe.
	{	Epicome.
		Epignathe.
		Hypognathe.
		Paragnathe.
		Augnathe.
Tribu II.....	{	Pygomèle.
		Gastromèle.
		Notomèle.
		Céphalomèle.
		Mélomèle.
	{	Déroeyme.
		Endoeyme.
Tribu III.....	{	
	{	

Barkow's [*Monstra animal. dupl. per anat. indig. Tom. II., 1836.*] classification of double monsters is extremely simple, and is established on an embryological basis. He includes them all in one class, of which he makes three orders:

I. Separation of the upper (or anterior) portions of the united bodies.

II. Separation of the lower (or posterior) portions of the united bodies.

[F.]

III. Separation of the upper (or anterior) and the lower (or posterior) parts of the united bodies.

The recent classification of Otto [*Monstrorum sexcent. descript. anatom.* 1841.] is, in many respects, like those of Buffon, Blumenbach and Meckel. In it all malformations are arranged in three classes, viz:

First. *Monstra deficientia*, with three orders.

Second. *Monstra abundantia*, with two orders.

1. *Monstra ex duobus coalita*.

2. *Monstra luxuriantia*.

Third. *Monstra sensu strictiori deformia*, with four orders. The details are omitted, as the system does not merit high consideration.

Bischoff's classification [*Wagner's Handwörterbuch der Physiologie*, Bd. I, 1842.] is founded on purely anatomical characters, which he considers a far more reliable and less objectionable basis than any mere physiological principle, and therefore the only tenable ground. He makes the three following classes:

I. Malformations by defect—deficient in some essential attribute of their kind.

II. Malformations by redundancy—possessing more than pertains to the standard of their kind.

III. Malformations by perversion—in which the organization does not conform to the standard of their kind, but without either deficiency or superfluity.

The second class comprises the following orders:

1. Malformations from superfluity of single parts, with a single head and trunk.

2. Double malformations, with double head and trunk.

a. Double above and single below.

b. Single above and double below.

c. Double both above and below.

3. Double malformations from implantation—fœtus in fœtu.

4. Triple malformations.

The distinctive peculiarities of the third class are of a negative character, as change of position, forms of organs, &c.

Vrelik [*Cyclopædia of Anat. and Physiol.*, Vol. IV, Part II, Art. *Teratology*, p. 967.] under the head "Monstrosities produced by excess of development," makes three classes, viz:

I. Fœtus in Fœtu.

II. Heteradelphic double monsters—in which one of the fœtuses is more or less perfect, and the other merely an appendix to it.

III. Double monsters—of which he makes five orders:

1. Anterior duplicity—united at the lower end of the sterna and the abdomens, with two thoracic cavities.

2. Lateral duplicity—united laterally and having a common thoracic cavity.

3. Inferior duplicity—united at the buttocks.

4. Posterior duplicity—united at the back of the vertebral column, to the back of the heads, or pelves.

5. Superior duplicity—united by the crania.

This classification is purely one of convenience ; it is not founded on either anatomical or physiological principles.

There are scarcely any other systems of classification that are worthy of notice, being mere modifications of those above given.

DIPLATERATOGRAPHY.

This term is proposed to embrace the description and diagnosis of the special forms of double monsters.

In the preceding chapter the classification which will be adopted in this essay is briefly explained. Compound malformations are embraced in a single class, which is subdivided into three orders, established on the basis of *duplicity with separation*, first, at the cephalic pole of the neural axis; second, at the caudal pole, and third, co-existing at both extremities of the cerebro-spinal axis.

In treating each order, genus, or species, the highest degree of development attainable within its prescribed limits is taken as the *type*. The typical form is to be kept prominently before the student as the actual and complete representative of the genus or species under consideration; or to express it in more scientific terms, to represent the maximum or plus quantity, in contradistinction to the inferior degrees, or greater departures from the typical forms which may be denominated the minus proportionals.

The typical cases are first described, after which the inferior degrees or minus quantities are arranged in a descending scale according with their departure from the classical type.

DOUBLE MONSTERS.

Synonyms.—Monstra duplicia, Monstra bigemina, Monstra tricorporea, Monstres doubles, (F). Duplicitas monstrosa, Diplosomatia, Diplogensis, Diplogénèse, (F). Diplasmus, Diplosis, Terata diploa, Terata didyma, Terata disoma, Doppelmissgeburten, (G). Doppelmissbildungen, (G).. Dubbelde misgeborten, Zwillingsmissgeburt. Twin monsters. Double malformations. Multiple monsters.

ORDER FIRST—*Terata catadidyma*.

Der.—From *τερας*, *τερατος*, ‘a monster,’ *κατά*, ‘down,’ and *διδυμος*, ‘a twin.’

Def.—Duplicity with more or less separation of the cerebro-spinal axis from above downward, or from the cephalic, towards the caudal pole of the neural axis.

Syn.—Monstra a superiore seu anteriore duplicia.

This order includes all cases of double malformation in which the cerebro-spinal axis is either wholly or partially duplicated and separated from the cephalic towards the caudal extremity. It embraces four groups, each of which is characterized by marked peculiarities of form and structure. The genera are given in the order of their departure from the highest to the lowest degrees of development embraced within the limits of the order.

Genus I.—PYGOPAGUS. The separation extends as low as the pelvis, the attachment being comparatively slight and unimportant. Two umbilical cords.

Genus II.—ISCHIOFAGUS. The separation extends to the pelvis, the union is more intimate and important. One umbilicus and funis.

Genus III.—DICEPHALUS. Two distinct and separate heads. The trunk may be double as low as the abdomen, or single. One umbilicus.

Genus IV.—DIPROSOPUS. The heads are more or less fused, presenting two faces, body single.

GENUS I.—PYGOPAGUS.

[Figs. 6-14.]

Derivation—From *πυγή*, 'the nates,' and *πάγω*, 'I fasten.'

Definition—Two individuals more or less complete, separated as low as the pelvis, by the lateral or posterior portions of which they are united genitals double. In the higher degrees, the vital organs are independent, and each individual is supplied with an umbilical cord. In the lower forms the imperfect body is nourished through vascular communication with the well developed body.

Synonyms.—Pygodidymus, Opisthomelophorus, Heterodidymus. *Gurlt.* Didymus symphyoperinaeus. *Barkow.* Pygopages and Pygomeles. *Is. Geoff. St. Hilaire.*

General Characters.—This, in common with nearly all the genera of compound monsters, presents symmetrical and unsymmetrical forms. The former are the result of the maximum and equal development of the pygopagus, while the latter are the product of retarded or arrested development in one of the individuals composing a case belonging to this genus.

The duality is almost complete in the symmetrical or typical form of the pygopagus; the duplicity and separation extend throughout nearly the entire axis of the bodies.

The type is represented by two well and symmetrically formed individuals, united at the inferior and posterior portions of their pelvises. The vital organs are distinct in each, and each body is nourished in the foetal state by an independent funis. The fusion is commonly at the sacra, the ilia, or less intimately through the medium of the adjacent soft parts. The vertebral columns are not fused except at their lowest or sacral extremities; the ossa innominata are sometimes fused to a slight extent, while in other instances the coalescence is so extensive as to unite the contiguous bones into a single mass.

The component bodies are united latero-posteriorly, their faces being turned more or less from each other, as seen in the typical case of the Hungarian sisters—Helen and Judith. [Fig. 6.]

The alimentary canal is single in each body as low as the rectum, which is common to both. In females, the bladder, urethra and uterus are normal in each; the vulva is single and common to both individuals. [Fig. 7.]

In one case of male pygopagus the scrota were fused, but contained four testes; the penis was single. All other parts of the bodies were well formed.

The symmetrical pygopagus is exceedingly rare in the human subject, and yet more so in the lower animals.

The nonsymmetrical form—the pygopagus asymmetros—is much less rare, its lower degrees being not unfrequently seen in domestic fowls.

The pygopagi possess a high degree of viability, both in their maximum and minimum varieties. The capability of sustaining life, and even attaining adult age, is due to the non-fusion and independence of the vital organs.

Either individual may have local diseases independently; a general malady, however, has been observed to affect both bodies equally and at the same time. Their death is almost invariably isochronous.

In some instances surgeons have proposed separating the individuals by an operation. In one case [Treyling] the experiment was actually attempted; it however terminated unsuccessfully; both individuals died in consequence of the operation.

The genus pygopagus, as previously stated, may be divided into two groups according as it is completely or unequally developed, viz: Pygopagus symmetros, and P. asymmetros. The latter may be subdivided into two species. The first, embracing those cases which are comparatively free from the body of the well developed individual—P. disjunctus—presenting three varieties: 1. P. tetrapus. 2. P. tripus. 3. P. amorphus. The second includes the cases which are more intimately connected with the principal body, and which appear in the form of a tumor in the sacral or coccygeal region—P. conjunctus—with two varieties. 1. P. subdermaticus. 2. P. sacro-cysticus. The nomenclature sufficiently explains their characters for present purposes.

CASE 1. *Pygopagus symmetros*. FIG. 6.

[TORKOS. *Philosophical Transactions*, vol. 50, p. 311. *Pl. XII.*]

The case of the 'Hungarian Sisters,' Helen and Judith, is one of the most remarkable of any on record. They were born in Szony in Hungary, October 26th, 1701. Helen first presented and was delivered as far as the navel. After three hours her lower extremities passed, the body of Judith soon followed, in the reverse order from that of her sister.

The children were united, as represented in Fig. 6, by the nates and the lower portion of the loins. This peculiar position and cohesion of the bodies was attributed to the force of the mother's imagination during the period of gestation.*

In their sixth year Judith had an attack of paralysis of the entire left side, and although she recovered, she was ever after weaker, less active, and apathetic. Helen, on the contrary, was active, sprightly and intelligent. Both are said to have been very handsome.

Menstruation was established in their sixteenth year, and continued regularly all their life. It did not occur at the same period in both; one usually menstruated a week or more later than the other.

They both had measles at the same time, and also smallpox, but other maladies affected them independently; for example, Judith was often convulsed, while Helen remained free from indisposition. When one suffered from catarrh, or cholice, the other continued well.

When venesection was required for either, it was always performed on Helen, in consequence of her superior strength.

They were publicly exhibited in England, as well as through most of the countries of Europe, during a period of seven years.

They exhibited a remarkable inclination and aptitude to acquire learning. They were fine singers, and spoke several languages with facility, viz.:

* "Attentius canes contemplabatur coeuntes, arctius coherentes, et capitibus erga se invicem quodammodo conversos, eosque sibi crebrius præfigurabat."

Hungarian, High Dutch or German, and French, and to some extent the English language.

In their tours through Germany, Italy, France, Holland, England and Poland, they attracted the attention and investigation of the most celebrated naturalists, physiologists, and psychologists of Europe. Accounts of their structure and endowments were published in various works. They were also celebrated in song by several poets, among whom the distinguished Alexander Pope may be mentioned.

They could not walk side by side; when one went forward the other was obliged to go backward. When one stooped to pick up anything, she necessarily raised her sister quite from the ground, and carried her on her back, an act which Helen often performed, being stronger and more active than her sister.

They had no sensibility or feeling in common, except in the immediate vicinity of the line of coalition.

The vulva was common to both; it was hidden inferiorly between the four thighs. The vagina began single, but soon divided into two distinct canals. All the other portions of the genito-urinary organs were normal in each. In like manner there were two intestinal canals terminating in one rectum. The desire to defecate was experienced by both simultaneously; but not so with the inclination to pass the urine, which occurred at variable periods, and occasionally gave rise to disputes between them, though in general they were very amiable toward each other.

The spinal columns were intimately fused from the second vertebral element of the sacrum to the end of the coccyx, which terminated in a single point.

The two aortæ anastomosed inferiorly, at the point where the iliacs are given off; the ascending venæ cavæ were connected correspondingly, thus establishing a large and direct communication between the two hearts, producing of course a great community of life and functions. Their temperaments were decidedly different, and their mental functions and nervous systems seemed to be quite independent. One often slept while the other was awake, and one was sometimes even occupied in reading or writing, while her sister was in a state of profound repose. They were also affected differently by hunger, and other sensations. At the age of nine years they were placed in the convent of Presburg, where they passed the remaining twelve years of their life.

They died on the 8th day of February, 1723, aged twenty-one years, three months, and twelve days. The cause of Judith's death was disease of the brain and lungs. Helen, who had previously enjoyed good health, was taken ill with slight fever soon after her sister's indisposition, and suddenly sank into a state of collapse, yet preserving her mental faculties. After a short struggle, she fell a victim to the malady of her sister, both expiring almost at the same instant. They were buried in the convent of the nuns of St. Ursula at Presburg.

The reader, by examining Fig. 6, might be led to suppose that the Hungarian Sisters were merely united by one hip, the fusion extended across from one ilium to the other, and a little above the point indicated in the engraving.

Eccardus [*De sororibus gemellis, cohærent.*, 1709] discusses several physical, moral and religious questions in reference to the Hungarian Sisters. First, The propriety of separating them by a surgical operation? To which he replies, that notwithstanding many physicians and surgeons thought it would have been possible, without incurring much danger, he was of the opinion that for many reasons it would have been extremely

hazardous and unjustifiable. He adds, "should one die before the other, I would advise immediate separation, which should be done through the lifeless parts." Second, Whether their condition would admit of, or justify the solemn rite of matrimony? He answers, that physically there are no serious objections, but morally there are insuperable ones, more particularly on account of the extreme liability of propagating monsters!

The third question which he considers is: Whether these sisters, at the last day, will rise joined as in life, or appear separated? To this question he gravely replies, that as they were united by accident, "we are indeed firmly persuaded that the sisters will rise again, and will appear with bodies separated, or rent asunder."

In the little work of Eccardus (page 29) will be found a curious specimen of Latin poetry, composed by a Hungarian physician, as an inscription for a bronze statuette of the "Wonderful Sisters, Helen and Judith." I have furnished the reader with a translation, as nearly literal as possible, and have given the original in a foot note.*

Two sisters wonderful behold, who thus have grown as one,
That nought their bodies can divide, no pow'r beneath the sun.

The town of Szoenii gave them birth, hard by far-famed Komorn,

Which noble fort may all the arts of Turkish sultans scorn.

†Lucina—woman's gentle friend—did Helen first receive,

And Judith, when three hours had passed, her mother's womb did leave.

One urine-passage serves for both, one anus, so they tell;

The other parts their numbers keep, and serve their owners well.

Their parents poor did send them forth, the world to travel through,

That this great wonder of the age should not be hid from view.

The inner parts concealed do lie, hid from our eyes, alas!

But all the body here you view, erect in solid brass.

CASE 2. *Pygopagus symmetros*. FIG. 8.

[F. H. RAMSBOTHAM, *Med. Times and Gazette*, Sept. 29th, 1855, p. 313.]

The following description of a living symmetrical pygopagus is quoted entire from the journal above cited. The united children were exhibited in London in the year 1855:

"A description of the United African Twins, now being exhibited at the Egyptian Hall, Picadilly."

"Two African girls whose bodies are indissolubly joined together. They are five years old, and are as well grown and plump as most children of the same age. One of them is rather larger than the other, which was the case when they were born. The band of union is sixteen inches in circumference. It commences about the inferior edge of the first division of the sacrum, and involves all the bones below that line to the extremity of

*Corpora binarum sic concrevere sororum,

Non nisi Divina dissocianda manu.

Szoenii patria est, vicus Comorae conterminus arci,

Quae nunquam Lunae paruit imperio.

Amplexa est unis Helenam Lucina priorem,

Horis deinde tribus nata Juditha fuit.

Exitus urinae patet unicus, unicus alvo,

Observant numerum coetera membra suum.

Misit ad ignotas tenuis fortuna parentum,

Neu pereat tantae fama stupenda rei.

Interiora Latent, neqVeVnt abstrVsaVIDeri,

EXIgVo totVM CorpVs In ære patet.

† An epithet applied to Juno and Diana, as being the goddesses who presided over childbirth.

the coccyx. The point which may be distinctly felt is blunter than ordinary, as though the two bones were fused in one.

There is no doubt that the bones themselves are joined together by ossific deposition; and that the union extends throughout; the right half of the lower part of the sacrum belonging to one child, and the left half belonging to the other, and the same through the coccyges of both, also including the posterior edge of the sacro-iliac symphysis, below the posterior superior spinous process of the ilium. There is, consequently, a deeper sulcus at the junction of the bodies on one side than on the other. On the shallow side the bony union cannot be felt, the skin not being sufficiently yielding. All four of the tuberosities of the ischia appear perfectly distinct. There is but one anus, occupying the position it would naturally do, as regards the coccyx in one of the children, provided that child were separated from its sister. In a corresponding part of the body belonging to the other child, there is a deep, blind depression, such as we see in one variety of imperforate anus, looking very much, when superficially examined, as if it were the termination of another rectum. Within the anus the finger passes into a wide cavity, the common continuation of the two intestina recta; but the place where these two bowels unite into one canal is out of its reach.

There are two sets of external genital organs, at the lowest part of the union of the two bodies, two clitorides, two hymens, and two meati urinarii; but there is no fourchette; for the labia externa of each running backwards in relation to each body, behind the symphysis pubis, meet the labia coming from the other, and by their junction produce an appearance of there being only one vulva.

Each of these conjoined labia is not longer than an ordinary labium of a child of the same age—about one inch—and the fossa navicularis, although it contains a double set of external organs, is but little larger than if it belonged to a single child. The genital fissure, instead of commencing anterior to the lower part of the symphysis pubis, begins quite underneath, at some distance behind the symphysis. Each symphysis pubis is formed as is natural, and they are separated from each other by a considerable space. The anus is on one side of the vulva, so that what answers to the perinaeum, about half an inch in extent, runs laterally to the tips of the coccyx, which is somewhat twisted to one side. There are two vaginae, and without doubt two uteri.

The children stand not quite back to back, but rather sideways; so that they are able to place their arms around each other's neck, and give each other a kiss; but they cannot walk side by side. When lying, one reclines upon her back and the other upon her side.

Their systems do not act at all in unison, for one can be awakened without disturbing her sister; one is often hungry when the other is not; one indeed is sometimes eating while the other is sleeping; and their pulses are far from being synchronous. Although there is but one anus, the action of the bowels is distinct to each, and performed by each at different times, the one giving the other intimation of the inclination. If aperient medicine is administered to one, it does not affect the other. There is reason to believe, that although the sacra are united, the caudæ equinae are separate, and each is inclosed within its own proper sheath; for if the external genital organs of one are touched, the other does not feel it; and the same remark applies to their lower extremities as well as to other parts of their persons. They run about with amazing ease and activity. Their dispositions are both very amiable, though one is milder than the other in temper, the little one having the most "pluck," and their intelligence is equal to, if it does not exceed that of most European children of the same age. They play together with their toys; they seldom have contrary

wishes, and although there are at times little tiffs between them, they have never been known to have a downright quarrel. These particulars I obtained from the gentleman who has the charge of them. He tells me he has never seen their mother; but was informed by their aunt, who was present at their delivery, that the labor was rather tedious, though not to be considered difficult, and that they were small at their birth. I cannot learn what part of their bodies presented, nor in what position they passed through the pelvis. The connection between these African twins bears a great resemblance to that of the Hungarian sisters, who were exhibited in London at the beginning of the last century."

Prof. H. V. N. Miller describes [*Southern Medical and Surgical Journal*, February, 1854,] a Pygopagus of African parentage so nearly like that detailed above by Dr. Ramsbotham that I am inclined to believe that it is the identical case. There is a discrepancy of over a year in the age, as given by each, yet neither gives the date, and Dr. R. does not even mention their names or the country that gave them birth. Prof. Miller says,

"These children, named Millie and Christina, born in North Carolina, of African parentage, are females, now about two years old. They are united posteriorly. The os coccygis of each seems to be bent backwards and to become continuous with that of the other. The lower portion, to probably one-third of the extent of the sacrum of each, is in like manner joined by bony union to the corresponding portion of the sacrum of the other, forming, with the muscles attached to them, and the general integument, a firm band of two or three inches in diameter, but so short that the nates of each child are pressed against those of the other. They are thus united back to back, but not exactly parallel; there is a slight inclination to the right side of the one and to the left side of the other. In consequence of this obliquity, they lie more comfortably upon one side than the other, and from having been from birth constantly laid in this position, their heads are not symmetrical, the bones of the cranium having apparently yielded to the continued pressure in one direction."

They have a common anus, and common vulva. They both have the desire to go to stool and actually discharge their feces at the same time. "The urine is discharged separately, and at different times. Hunger and thirst may be felt by one and not by the other: one may be sick and the other well; one suffered severely from teething, the other but little. One of them is a larger, stouter child than the other, but not perceptibly more intelligent. Their intellectual operations are as distinct as though no union existed; they amuse themselves together as do other children—sometimes become angry and resort to blows, and, even at their early age, are very ready each to accuse the other of faults committed between them. They are still too young to determine what will be for them the easiest mode of progression. They can stand and walk a few steps either laterally or forward for one of them, while the other follows by a backward movement. The side step is that which most probably they will ultimately adopt."*

I have just received a letter from my friend Prof. Charles A. Lee, dated May 9th, 1866, enclosing a photograph of the "Carolina Twins," and a show-bill for their exhibition in Washington, D. C., May 7th, 1866, announcing "A most wonderful and indescribable natural curiosity, universally admitted by the medical profession of Baltimore to be the greatest wonder ever heard of in medical experience or books." The programme

*From the Am. Jr. of the Med. Sci., July, 1854. Vol. xxviii, p. 289.

contains a list of popular songs which the "twins" were to sing; also "experimenting with the twins by a committee selected from the audience; skipping the rope," &c. The bill states that they "are quite comely, very intelligent and well educated; they sing finely, dance remarkably well, and are very pleasing to the eye,—with them it is literally, 'two souls with but a single body!'"

Prof. Lee says, "I have just come from visiting a monstrosity that will interest you much. It is that of two negroes united from the lumbar vertebræ down to the end of the sacrum. There are two heads, two bodies, four arms, four legs, one anus, one vagina, one desire to urinate and one to defecate (simultaneous.) Two hearts, *one on the left side of the one, and one on the right side of the other girl.* Their names are Millie and Christina. Born of slave parents in 1852, in Columbus Co., N. Carolina, they weighed seventeen pounds. Pain or sensation below the union is felt by both. One can locate its seat, the other cannot, but feels it; could tell, for example, how many times I pinched her sister. They are very active and intelligent, sing well, read, dance, and run; never quarrel or disagree, have splendid Caucasian heads. They have menstruated seven months. They have never been sick but once; then had fever and ague, taken at the same time. Mother weighs 140 lbs., father 160; both full blooded Africans, mother has had 17 children.

One of the sisters may have headache, the other not, one may sleep while the other is awake, &c. They experience hunger and thirst, however, at the same time; appetite good; height of one four feet five and a half inches; of the other, four feet, six inches. They are united back to back, they have both become accustomed to face the same way, so that the *outer legs*, (one right, the other left) are larger, better developed, and stronger than the inner; the feet of course are placed quite obliquely when they walk. The larger one can walk and carry the other. They walk well on the outer legs.

The keeper, Mr. Smith, would not allow me to see them naked, nor place my hand under their clothes to examine the pelvis. * * * *

I send you a photograph and show-bill."

Fig. 8, is a lithographic copy of the photograph.

The editor of the *Daily Evening Bulletin*, of Philadelphia, May 18th, 1866, says—"The nerves of sensation which center in the spinal column affect both girls in precisely the same degree, while there is independent action above the point of contact. To explain our meaning better, we would say that if a visitor were to touch Millie upon the toe, Christina would immediately turn her head in response to the touch; while pinches upon the arm, or a touch upon any part of the body above the point of contact would only be felt by the person touched."

This would imply an inoculation of the spinal nerves which compose the great sciatic trunks.

The editor also adds,—“They chat with each other almost incessantly when not otherwise occupied, and the two talk with different persons upon different subjects at the same moment.

They seem perfectly cheerful in their strangely blended condition; declare that they know of no inconvenience resulting from it, and protest that they would be unhappy if they were separated, were such a thing possible."

This case is strikingly analogous to that of the Hungarian sisters; the cases differ principally in the Carolina twins having common sensibility below the point of junction of the two bodies.

Postscript.—Since the above has been in type, and the proof was received for revision, I have had an opportunity to make a personal examination of

the "Carolina Twins." On Wednesday, July 18th, 1866, I visited *Barnum's Museum*, in New York city, for the purpose of seeing the African sisters—this living symmetrical *Pygopagus*. The statements of Profs. Miller, Ramsbotham and Lee, which are given above, were nearly all confirmed. The "twins" are now in their fifteenth year; they are in excellent health; their combined weight is one hundred and fifty-nine and a half pounds. They are well formed; and resemble each other very much; their complexion is that of the fair mulatto; their features and expression are rather pleasing; they are very cheerful and intelligent; fond of reading; sing very sweetly, and converse modestly and fluently. They dance a *schottisch* gracefully, and run with remarkable celerity. In running or walking they advance the inner limbs together, (being the right of one, and the left of the other,) and then bring forward the outer limbs which touch the floor simultaneously. They can walk quite readily with their outer limbs alone, by holding up the inner ones; in which case the right and left outer limbs are moved alternately as in a single individual. The union extends from the top of the sacrum across from one ilium to the other, with a slight degree of obliquity, which is more considerable in the bodies above the junction, the result of long continued position while lying in bed, and of voluntary effort with a view to convenience while standing or sitting. The inner limbs are a little shorter than the outer ones; the result is, that in standing, the outer feet rest firmly on the floor, while the inner ones merely rest upon the front parts, the heels being elevated. Standing, as above described, Christina is the left hand twin; she is somewhat larger and stronger than Millie. Christina lifts Millie when she stoops, and even walks or runs with her with great ease, no pain or strain is experienced at the seat of junction. Millie being weaker cannot perform the same feat with her sister. The woman who has the care of them informed me that they experience the desire to defecate, or to urinate simultaneously, only one anus and rectum exists. I was assured that the urine is voided in a single stream. I was not permitted to examine the genito-urinary organs. The day that I examined the twins was very hot, the mercury was above 90° of Fahrenheit's scale. I counted the pulse of each, while they were standing, and found Christina's to be 68 per minute, and Millie's to be 80. The apex of Christina's heart is on her left side, while that of Millie is distinctly felt in her right side. I fully satisfied myself that sensibility is common to both at all points below the seat of fusion, which is due, no doubt, to coalition of the spinal cords, or of inosculation of their terminal branches. They present every indication of attaining advanced life. They are the same case that was exhibited in London, and described by Prof. Ramsbotham.

CASE 3. *Pygopagus symmetros*.

[TREYLING. *Acta Acad. Nat. Curiosorum Tom. V. p. 445, Obs. 133.*]

Treyling relates the case of two united females who were born in the town of Carinola in Italy, one year prior to the birth of the Hungarian sisters [A. D. 1700.]

Their junction is said to have been similar, though less extensive than that of Helen and Judith. The osseous coalition was confined to the coccyges, yet their connection was so intimate and important that only one

anus existed. When they reached the age of four months, a surgeon, more bold than judicious, separated them by an operation which terminated fatally. The direct cause of death is stated to have been from convulsions, the result of the operation.

The fact of the existence of a common anus, and the important vascular communications which are found in these cases, together with the unfortunate results of the above mentioned operation, ought to prevent any future attempts to separate individuals so indissolubly connected.

CASE 4. *Pygopagus symmetros*.

[BLACKBURN. *Transylvania Journal*, vol. VIII, p. 114.]

"Two children united from the sacrum to the coccyx, and one anus common to both. The pudenda were united; the labia were incomplete, inasmuch as there was but one for each child. They survived three weeks, and died of dysentery, one five minutes after the other." *Beck's Med. Jurisprudence*, vol. 1, p. 423. *Eleventh Edition*, Phil., 1860.

CASE 5. *Pygopagus symmetros*.

[WALTER. *Mus. Anat., Berlin*, Part 1, p. 128, No. 2,997.]

Walter gives a brief account of a case of a human pygopagus similar to those above described, "of nine months." I am unable to state whether it was born at the end of the ninth month of gestation, or survived its birth nine months.

CASE 6. *Pygopagus symmetros*. FIG. 7.

[BARKOW. *Monst. Duplic. Animal*. Vol. 1, p. 17. Pl. 1, fig. 9.]

This case is merely referred to on account of the figure which I have copied, (Fig. 7,) to illustrate the relative anatomy of the parts involved in the coalition of the pygopagus. A, B, right and left compound kidney, a, b, supra renal capsules; c, d, superior hyli; e, f, inferior hyli renales; g, h, i, i, ureters; j, j, right and left rectums; k, l, vaginas; m, n, external orifices of the rectums; o, p, perfect labia majora; q, r, perfect labia minora; s, t, imperfect labia minora; u, u, u, u, Fallopian tubes; t, t, t, t, ovaries.

CASE 7. *Pygopagus symmetros*. FIG. 10.

[GURLT. *Handbuch der Path. Anat. der Haus-säugethiere*. Atlas, Taf. XV, fig. 6.]

The figure is copied from Gurlt's plates. It represents an example of the symmetrical pygopagus which occurred in the calf of the common cow. This is an extremely rare form of double malformation in the lower animals. Gurlt denominates it *Pygodidymus aversus*.

LITERATURE. Torkos. *Philosophical Trans.*, vol. 50, p. 311. Pl. xii. Eccard. *De sororibus gemellis, cohærent*. 1709. Ramsbotham. *Med. Times & Gazette*. London, Sept. 29th, 1855, p. 313. Treyling. *Acta Acad. Nat. Curiosorum*. T. V. p. 445, Obs. 133. Walter. *Mus. Anat., Berlin*. Part 1, p. 128, No. 2,997. Barkow. *Monst. Duplic. Animal*. Vol. 1, p. 1. Gurlt. *Handbuch d. Path. Anat. d. Haus-säugeth.* Atlas, Pl. xv, f. 6. C. F. Wolff. *Act. Acad. Scien. Imp. Petropol.* 1778, p. 41. Normand. *Bull. de la Fac. de Med.* 1818. Blackburn. *Transylvania Journal*, vol. viii, p. 114. Miller. *Southern Med. & Surg. Jr. (U. S.)*, Feb., 1854.

PYGOPAGUS ASYMMETROS, VEL PARASITICUS. FIGS. 9 AND 11-14.

Synonyms: Opisthomelophorus, Heterodidymus. Gurlt. Pygomeles. Is. G. St. Hil. Didymus symphyoperinaeus. Barkow.

The non-symmetrical forms of the Pygopagus may be divided into two species: The first, *Pygopagus disjunctus*, to include those cases in which the imperfectly developed, or parasitic portion of the compound body is more or less free or distinct from the principal body. The second species, *Pygopagus conjunctus*, to embrace those cases which are so intimately blended with the well developed body as to appear in the form of a tumor in the posterior sacral region.

I. PYGOPAGUS DISJUNCTUS. FIGS. 9, 11.

The Pygopagus disjunctus may be subdivided into four varieties: 1. *P. bicephalus*. 2. *P. tetrapus*. 3. *P. tripus*. 4. *P. amorphus*.

General characters.—In the cases of Pygopagus disjunctus in the human subject, there will be found in the vicinity of the sacrum, of an otherwise well formed body, a tumor of variable size, consisting generally of an irregular mass, which usually terminates in rudimentary extremities, on which feet or hands can be more or less readily recognized. The mass is composed in great part of fused lower extremities, sometimes upper extremities, and occasionally of intestine, etc. The whole is enveloped in an integument which is a continuation of that of the nates of the well developed body. Its more intimate continuity with the normal body is effected by fibrous bands, or osseous union with the sacrum.

In one case, which is probably unique, the so-called parasite consisted of a head and neck attached to the sacrum, which I shall denominate the *P. bicephalus*. In the lower animals, particularly with domestic fowls, instead of a tumor, we find either two well developed pelvic extremities, or one, which consists of two, more or less intimately fused. They are commonly free from the main body, except at the point of junction, which is generally, through the medium of a rudimentary pelvic mass, in close proximity to the normal sacrum.

The above subdivisions and nomenclature are made merely with a view to convenience in the description and designation of the several varieties which are now known, or which may in future present themselves.

The physiological interest of the classification consists merely in pointing out the maximum and minimum extremes of development in the genus; the intermediate forms may present a multitude of variations, differing not in kind, but simply in quantity. The object of distinctive names for special forms is merely, as above stated, to avoid confusion in the description of cases.

CASE 8. *Pygopagus asymmetros*, var. *bicephalus*.

[CHABELARD. *Mém. de l'Acad. Paris*, 1746.]

This case is probably unique; it consisted of a head, which was turned face downward, and connected by a neck to the sacrum of a well formed body. The other portions of the imperfect body were absent in consequence of arrested development.

CASE 9. *Pygopagus tetrapus*.*

[PROF. J. B. S. JACKSON, *Catalogue of the Boston Soc. for Med. Improvement*, p. 313. *Prep. No. 862 of the Anatomical Museum of the Society*.]

This specimen consists of a chick, preserved in alcohol, having two supernumerary extremities growing from the back of the pelvis, near the sacrum; they are not developed equally with the normal extremities; the thighs are connected by integument.

I have made a careful personal inspection of this, and all the other specimens of double malformation contained in the Museums of the Boston Society for Med. Improvement, the Medical Department of Harvard University, and the Museum of Comparative Anatomy, under the charge of Prof. Jeffries Wyman, at Cambridge, Mass.

CASE 10. *Pygopagus tetrapus*.

[JACKSON, *Catalogue, &c.*, *op. cit.*, p. 313. *Prep. No. 863*.]

The skeleton of a chicken that resembled the last specimen (No. 862). The supernumerary extremities have a slender attachment to the coccyx upon the left side; they are well developed; a small irregular bone—a rudimentary pelvis—being connected with the upper extremity of the two femora. Otherwise well developed.

CASE 11. *Pygopagus tetrapus*.

Preparation No. 425, of the Museum of the Med. Dep. of the Penn. Univ., is a chick of the common hen, having two supernumerary legs attached near the anus.

CASE 12. *Pygopagus tetrapus*.

On the occasion of a visit to Philadelphia, for the purpose of examining the double monstrosities in its Museums [June, 1863], Prof. Joseph Leidy informed me, that at that time he frequently saw in that city a full grown living cock, which had four legs; the two posterior ones, attached at or near the rump, dragged behind the fowl as he walked about.

CASE 13. *Pygopagus tetrapus*.

[*Recueil des Ecartés de la Nature*.] This work is said to contain a description of a quadruped Pigeon, which is alleged to have used all four of its legs indiscriminately. I have not examined this reference, and cannot speak of the case with confidence in regard to its precise character, and its relations to the species under consideration.

CASE 14. *Pygopagus tetrapus*. (?)

[*London Lancet*, Vol I. p. 188. Oct. 30th, 1830.]

It is with considerable hesitation and doubt that the following case is given in this connection. It appears to occupy an intermediate or transitional position between the unequivocal cases of *pygopagus* and the cases of mere supernumerary extremities, in which no duplicity is found to exist in the pelvis, the viscera, or in the cerebro-spinal axis.

I have admitted it under this head in consequence of the evidence of duplicity existing in the pelvis. The account given in the *Lancet* is not entirely satisfactory; it is, however, all that I have found which relates to this case:

“At a sitting of the *Académie des Sciences*, on the 6th of September, 1830, a child with four legs and feet was presented by Madame Hen, midwife, who had been present at its birth. The following is an extract from the report of M. Geoff. St. Hilaire on the case:

* From *τετρα*, ‘four,’ and *πους*, ‘foot.’

'The child is of the male sex, born at Paris, July 4th, 1830. The labor was natural. Its monstrosity consists in the lower extremities being double; the pelvis is regularly formed, but there is evidently a tendency towards the formation of a double pelvis, there being, between the coccyx and the left half of the pelvis, an osseous rudiment, by which the sacral bone and the coccyx are pushed towards the right, and which may be considered to represent the additional iliac and ischiatic bones in an atrophied state. The heads of the supernumerary thigh-bones are in the same sockets as the natural ones, and consequently so close to them, that though the thigh-bones are distinctly double, the thighs, down to the knees, are simple. From the knee, however, the monstrosity is more striking, the additional limbs being perfectly separated from the regular ones. The left additional leg is ankylosed, and united to the regular one at a right angle; it is directed towards the right, also the foot. The external ankle is turned downward. The right additional leg is shorter and more closely united to the regular one; its direction is the reverse of the left, it is more naturally formed, and has five toes, the other having only two. Both legs seem to be immovable.

Between the two normal nates, there is a third, over the rudimentary pelvis; the anus is nearly below the middle of the third buttock, and the scrotum is between the two left thighs; the testicles have not yet descended.'

The child was in good health at the time the report was made."

As the report is not accompanied with figures, it is difficult to comprehend the precise relation of the parts.

CASE 15. *Pygopagus tripus*. FIGS. 9, 11.

[AMMON. *Die Angeborenen Chirurgischen Krankheiten der Menschen*. Taf. 34, fig. 1, 2.]

The subject of this was a well developed girl, ten years of age. The formation in question, being a large pedunculated tumor-like mass, attached to the nates of the main body, consisted of a large thigh and two fused legs. No patella could be found. The knee was firmly ankylosed. One foot had six toes; the other, which appeared to be a mere out-growth from the better formed foot, was very rudimentary, and had but two toes.

CASE 16. *Pygopagus tripus*.

[*Jackson's Cat. Boston Soc. for Med. Imp.*, p. 313.]

Preparation, No. 864, is described in the above catalogue as follows:

"A portion of the skeleton of a *Fowl*. Upon the right side there is an additional ischium, somewhat developed, and situated between the sacrum and the ischium, with which last it is fused, the sacrum and coccyx being much inclined towards the left side. From this additional bone there arises a distorted extremity. The tibia is a short, thick, stout bone, about one inch in length, the femur and metatarsal bones being tolerably developed. The toes are five in number, one of which is bifurcated."

CASE 17. *Pygopagus tripus*.

[*JACKSON, op. cit.*, p. 314.]

Preparation, No. 865, of the same Anatomical Museum, consists of the mounted "Skeleton of a *Chicken* that lived three months. The left femur, which is formed by the union of two, is very broad; has two distinct trochanters, and terminates inferiorly in two extremities, one of which is well developed. The supernumerary member has, in the place of a tibia and fibula, two bones that look not unlike tibiae, being largely and about equally developed, separate above, but soon becoming fused, and connected with the femur by two additional and distinct articulating surfaces. The metatarsal bone is short, slender and very much bent upon itself; beneath

it there was, during life, a callus, this division of the extremity being as much, or even more used in progression than the other; the whole terminates in three imperfect toes. In the pelvis there is some appearance of duplication upon the left side, but, otherwise, the skeleton is well formed, as were the internal organs, except that *the intestine had four caeca*, two of them being large, one small, and one of intermediate size."

This Pygopagus resembles Case 14, which occurred in the human subject.

CASE 18. *Pygopagus tripus*.

[*Anatomical Museum, Med. Depart. Univ. of Penn., Prep. No. —.*]

This preparation, presented by Dr. Norris, is the skeleton of a full grown hen. To the left of a normal sacrum a rudimentary pelvis (an amorphous osseous mass,) is attached, from which arises a sympodiatic additional extremity, consisting of a fused thigh, leg, and foot, the latter being furnished with normal toes and claws. The bones of this supernumerary extremity are as large and well developed as the normal ones. In locomotion, this redundant compound leg must have dragged behind the fowl, and probably occasioned very little inconvenience.

CASE 19. *Pygopagus tripus*.

A few years since one of my friends had in his possession a three-legged domestic duck, which grew to maturity. The supernumerary extremity, formed by the coalescence of two, was as large as the normal ones. It was attached to the main body, near the sacrum. In progression it dragged between the natural legs.

CASE 20. *Pygopagus tripus*.

[*Prof J. B. S. Jackson's Mss. notes.*]

Prof. Jackson saw, in the Anatomical Museum of the University of London, "a small toad, having an additional and well developed long posterior extremity, attached to the right side of the pelvis near the median line. This supernumerary limb is evidently composed of the elements of two, as it is furnished with seven toes, five being the number belonging to the species."

LITERATURE. Chabelard. *Mém. de l'Acad. Paris*, 1746. Jackson. *Cat. Boston Soc. Med. Imp.* Nos. 862, 863, 864, 865. *Lancet*, London, 1830, v. 1, p. 188. Ammon. *Die Angebor. Chir. Krankh. der Mens. Taf. 34, f. 1, 2*. Otto. *Monst. sex. Descr. Anat. Nr. 415*. Fleischmann. *Der fœtus in fœtu*, 1845. Pitha. *Prag. Viertelj.* 1850, vii, 1. Weber. *Virch. Archiv. VI*, p. 520. Hesselbach. *Beschr. der Wurzb. Präp.* p. 237.

II. PYGOPAGUS CONJUNCTUS. FIGS. 12-14.

This species includes two varieties. The first embraces the cases of unequivocal Subcutaneous Pygopagus—in which more or less fœtal rudiments are found in a tumor-like mass; the second comprises the cases of so-called congenital sacro-cystic tumor. The distinction between the two varieties is not very definite, or satisfactory. The subdivision is made more with reference to convenience than on account of any real or supposed difference in their anatomical structure, or embryonic origin.

I. *Pygopagus subdermaticus*.

Cases of this kind are more common than any of the varieties of *P. disjunctus*. It constitutes the most frequent form in which the parasitic monsters, or fœtus in fœtu occur. They consist of a non-pedunculated tumor in the vicinity of the sacrum of an otherwise well formed body.

Upon opening the integumentary and fibrous sac, there is generally found a more or less imperfectly developed foetus. Where no foetal rudiments are found in tumors thus situated, uncertainty may arise in regard to their nature; it may or may not be the result of arrested development in one of the embryonic individuals of a *Pygopagus*.

I am strongly inclined to believe that most of the congenital tumors in the region of the sacrum and coccyx belong to the arrested, the non-symmetrical, or amorphous species of the *Pygopagus*, representing its minus proportional, or minimum development. This is not the proper place for the discussion of the question; the remark is merely dropped in passing. It will receive due consideration in the section devoted to the embryology of diplogensis.

The unequivocal Subcutaneous *Pygopagus* is generally invested with a fibrous membrane to which the foetal rudiments are extensively adherent; the fibrous envelope is likewise adherent to the adjacent structures, which is effected by various modes, and at several points. The variety under consideration is commonly attached to the spinal canal by strong fibrous bands, or even by firm osseous union to the sacrum, or to the ossa innominata of the main body.

The contents of these tumors consist principally of upper and lower extremities, on which the hands and feet may be quite well developed. Occasionally the skeleton is nearly entire. In some instances, loops of intestine are found, and in rarer cases, muscles, nerves, brain, and cranial bones are developed. Their nutrition is dependent on the main body, and is effected by vascular communication through the adjacent connective tissue. Those situated near the sacrum are supplied in most cases by an increased size and extension of the median sacral artery; in some instances the vascular supply is so inconsiderable that no apparent increase in the number or calibre of the normal surrounding arteries or veins can be observed. Frequently the mass is merely surrounded by adipose tissue.

Cysto-sarcomatous tumors are sometimes associated with the foetal tumor. In the rare case of Von Luschka, the foetal (parasitic) tumor was attached to a cysto-sarcomatous growth.

CASE 21. *Pygopagus subdermaticus*.

[W. SIMMONS. *Med. Facts and Observ.*, Lond., v. viii.]

The subject of this case of congenital tumor of the nates lived to the age of two years, when the surface of the tumor became ulcerated, and discharged an ichorous fluid, attended with irritation which proved fatal. In the examination of the tumor, its principal attachment was found to be by a ligamentous substance, extending to the os coccygis of the child. The tumor consisted of a mass of fat, containing in its center a closed intestine, more than a foot in length, filled by a fluid resembling meconium. There were also found, dispersed through the tumor, several portions of bone, some resembling tibiae, others the bones of the hand and foot, and there were some unlike any part of a perfect skeleton.

CASE 22. *Pygopagus subdermaticus*.

[LUSCHKA. *Virchow's Archiv*. xiii, p. 411. (Year Book of Med. & Surg. 1859. New Syd. Soc., p. 414.)]

"In Luschka's case of *hygroma cysticum perineale*, a very large cyst was attached to the lower part of the body, whereby the labor was so protracted

that the child died. The pelvis was filled with cysts, varying in size. There were also found within the tumor the remains of a foetus, viz., bones, intestines, &c. The case was one, not of simple hygroma cysticum, but a combination of the same with inclusion of the foetus."

CASE 23. *Pygopagus subdermaticus*.

[REINER. *Wiener Wochensch.*, 31-33, 1858. (Year Book. 1859. New Syd. Soc., p. 416.)]

"Reiner gives the description of a well formed child, having an excrescence situated between the ischial tuberosity and sacrum. This excrescence proved on examination to be a foetus of about three weeks, which had become adherent to the body of the healthy child. A ligature was placed round the pedicle of the excrescence, and its removal safely accomplished."

LITERATURE. Simmons. *Med. Facts & Obs.*, Lond. v. 8. Stanley. *Congenital Tumors of the Pelvis. Med. Chir. Trans. Lond.*, 1841, v. xxiv, p. 231. Pl. 5. Dickson. *Med. Times, Lond.*, July, 1850. Himly. *Foetus in foetu*, p. 40. Mayer. *Grüße u. Walth. Jr.* x, 1827. Wagner. *Fränk. Samml.* II, p. 342. Schaumann. *Diss. sist. cas. rar. foetus in foetu. Berlin*, 1859. Ammon. *Op. cit. Taf.* 34, fig. 3, 4. Schuh. *Wien. Med. Wechschr.* 1855. No. 51. Luschka. *Virch. Archiv. Bd.* 13, S. 411. Reiner. *Wien. Wochenschr.*, 1858, 31-33.

II. *Pygopagus sacro-cysticus*.

The distinction between this and the preceding variety, as previously remarked, cannot be very satisfactorily drawn. The tumor commonly consists of one or more cysts, surrounded, as in the above, by adipose or fibrous tissue. Generally no rudiments of a foetus are found. In some cases, however, hair, bone, and even imperfect cerebral substance have been discovered. In one case it was possible to recognize some of the facial and cranial bones. Mayer and Blizzard found an intestinal loop; Himly saw distinct superior maxillary bones, and rudiments of temporal, frontal, and ethmoid bones. In the greater portion of the cases in which foetal rudiments are found in the sac, they are, as Prof. Vrolik observed, but confused and ill-determined organic substances, intermingled with a few osseous and cartilaginous nuclei.

These tumors vary in size, from that of an orange to a full sized foetal head, and are sometimes even larger. They are attached to the sacrum and perineum, being nourished by the small arteries of the investing and adjacent connective tissue. A diversity of opinion exists among writers in regard to the nature and origin of these growths. Some maintain that they are the result of blighted ova, or arrested development in an early stage of embryonic life. Others take an opposite view, and regard them as morbid growths, entirely independent of an embryonic origin.

Without entering fully into the discussion, I will merely premise in this place that the doctrine of "ovum in ova," "foetus by inclusion," or "foetus in foetu," all of which terms imply the infolding, or implantation of an undeveloped ovum, germ, or embryo, in a mature body, rests upon very hypothetical grounds, and can be combated with strong facts and arguments. This theory requires that the ovum be included in the vitelline membrane, in which case, if fecundated, it would, according to the known laws of embryology, be developed in the intestinal canal, or in the umbilical vesicle,

neither of which has occurred in any well authenticated case. It accords more nearly with our present knowledge of embryology to regard these masses, which are found in the sacral region, as undeveloped embryonic rudiments, which, had they not been arrested in their development, would have produced, according to the degree of their perfection, some of the forms of the genus *Pygopagus*. It is not claimed that all cases of congenital sacral tumors have an embryonic origin, but especially such as contain organic structures, as hair, teeth, bone, intestine, &c.

Prof. Vrolik observes:* "If we take a survey of all the cases which are designated as *fœtus in fœtu*, and of the large number of theories on the origin of this monstrosity, which have been criticised by Himly, it is certain that none of them can be maintained. *It is most probable that the 'fœtus in fœtu' is an incomplete effort to form a double monster.*"

CASE 24. *Pygopagus sacro-cysticus*. FIGS. 12, 13, 14.

[VROLIK. *Tabulæ ad Illustrandum Embryogenesis Hominis et Mammalium*. Pl. C, figs. 1, 2, 3.]

The subject of this case, presented to the Vrolikian Museum at Amsterdam, by Dr. Holms, was born Nov. 30th, 1846. The figures [12, 13, 14,] which I have had reduced and engraved from the magnificent work of Prof. Vrolik, convey a correct idea of the usual form, situation, and attachment of this variety of growth. This tumor was ten and a half inches in diameter, and seven inches in length. It grew in proportion to the development of the child's body, the neck lengthening by the weight of the mass.

The child died by an accident, when one year old. The tumor is connected by fibrous bands to the coccyx, and lower portion of the sacrum. [Fig. 14.] The rectum passes in front of the tumor. Its arteries are derived from the pelvis. A section showed it to consist of adipose tissue, cartilaginous tubercles, and several osseous nuclei, "being," says Vrolik, "imperfect rudiments of an undeveloped *fœtus*."

LITERATURE. Vrolik. *Op. cit.* Pl. C, fig. 1-3. Himly. *Geschichte des Fœtus in Fœtu*, 1831. Ammon. *Die angeb. chir. Krankheiten des Menschen*. Taf. xi. Wernher. *Die angeb. Cysten-Hygrome*, Giessen, 1843. Gilles. *De Hygromatis Cysticis Congenitis Diss.* Bonn., 1852. Lotzbeck. *Die Angeb. Geschwülste der hinteren Kreuzbeingegegend*, München, 1858. Mauthner. *Arch. für Phys. Hlk.* xi. Bd., S. 141, 1852. Knopf. *Deutsche Klinik*, 1853, S. 461. Wittich u. Wohlgemuth. *Monatschr. f. Gbtsk.* v. 3, 1855. Langier. *Gas. des Hôpit.* No. 48, 1855. Weld. *Grundz der path. Histologie*, S. 539. Schuh. *Pseudoplasmen*, S. 474. Schindler. *Deutsche Klinik*, No. 19, 1853. Gläser. *Virchow's Archiv.* Bd. 13, S. 196. Luschka. *Ibid.*, S. 411. *Der Hirnanhang und die Steissdrüse*, Berlin, 1860. Virchow. *Verh. d. Ges. f. Gbtslufe*, x. S. 68, 1858. Heschl. *Oest. Ztschr. f. pract. Med.* 1860. Nr. 14. Stanley. *Med. Chirurg. Trans.*, London, vol. xxiv, p. 230, 1841. Gross. *Syst. of Surg.*, vol. ii, p. 988, fig. 747. *Phil.*, 1865. Keller. *N. Am. Med. Chir. Rev.* vol. ii, p. 314, fig. 1. *Phil.*, 1858. Pascallis. [Mazzony's case.] *Med. Repository*, vol. 17, p. 13, figs. 1-3. *New York*, 1815. Bouchacourt. *Lancet (Am. Ed.)* 1850.

* *Cyclopedia of Anat. & Physiology*. Vol. IV. Part II, p. 968. Art. *Teratology*.

GENUS II.—ISCHIOFAGUS.

FIGS. 15-44.

Derivation.—From *ἰσχω*, 'I arrest,' or *ἰσχιον*, 'the haunch,' and *πάγω*, 'I fasten.'

Definition.—The typical, or symmetrical Ischiopagus consists of two complete individuals whose pelves are so united as to form a common ring, or basin; the right pubic bone of one individual forms a junction with the left of the other, and *vice versa* on the opposite side. The common axis of the symphyses pubes is at right angles to the common vertebral axis. The heads are situated at the distal extremities of the longitudinal axis of the compound body. The abdomens are fused; single umbilicus, and funis; two sets of genitals; four pelvic, and four pectoral extremities. Vital organs normal and independent. See Fig. 15.

The non-symmetrical Ischiopagus presents a variety of forms which will be described under appropriate heads.

Synonyms.—Ischiopages. *Is. Geof. St. Hil.* Ischiadelphie, Ischiadelphus. *Dubruel.* Ischiodymia, Ischiodymus. *Cruveilhier.* Hypogastrodidymus. *Gurlt.* Didymus-symphypogastrius. *Barkow.* Inferior Duplicity. *Vrolik.* Hæadelphus. —.

General Characters.—The distinctive characteristics of this form of double malformation, as observed in its maximum development, consist in the union of two symmetrical and well formed individuals on a common vertebral axis, by fusion of the bodies at the pelves and lower portion of the abdomens. In each, the vital organs are independent. The pelvic extremities pass off on either side, in pairs, at right angles to the common axis of the trunks. The two limbs of each lateral pair are so perfectly symmetrical, in form and size, that they apparently occupy a normal relation to each other, while in fact, they consist of a right limb of one individual, and a left one of the other. The same is true of the external genitals. In the case of a male, each lateral penis and urethra is composed, in like manner, of two halves, one of which is furnished by each individual. This is also the case with the scrotum, testes, &c., and the same plan of arrangement exists in the case of females. There is invariably but one funis and one umbilicus, which is situated in the center of the united abdomen. The vertebral columns are complete; the extremities of the coccyges are contiguous, or fused. The right os innominatum of one body joins the left of the other, forming a lateral symphysis pubis, and *vice versa* on the opposite side. By this arrangement the pelvic bones form a single great ring, or basin, as seen in Figs. 21, 22.

The head and the thorax, with its extremities and viscera, are entire and normal in each.

To separate the two bodies of a symmetrical Ischiopagus, and give each its own parts, an incision must be made on a transverse line, through the common umbilicus and abdomen, bisecting the external and internal genitals, the symphyses pubes, rectums, urethras, and the bladder which is common to both. In a perfectly symmetrical and completely developed

Ischiopagus, there is neither redundancy nor deficiency in the structure of any portion of the body of either individual composing it.

It is worthy of remark, in passing, that this form of duplicate development—the *Ischiopagus symmetros*—presents a figure capable of being bisected, both longitudinally and transversely, thus producing homologous halves and homologous fourths. It furnishes an actual verification, and perfect demonstration of the ideal, or archetype figure of whole or *plus quantity*, the philosophy of which is so elaborately discussed in the remarkable work of Prof. MacIise.*

This philosophical anatomist maintains that any figure, for example, a vertebra, or even the entire human body, which, when bisected, presents only symmetrical bilateral halves, and not equal fourths, philosophically represents but one half of an ideal whole quantity. Whole quantity is typified and embraced only in a figure, capable of symmetrical bisection, both longitudinally and transversely, producing thereby both homologous halves, and homologous fourths; as, for example, a circle or sphere.

“The duplication of a vertebra, and the application of the centrum of one to the centrum of the other, produces a form which is symmetrically cleavable from back to front, and from side to side, as seen in Fig. 20, in which the vertebral form is repeated above as below, thereby producing a structural entirety, which, like the circle, is symmetrically cleavable either by the line 1, or 2.” See Fig. 20.

It is a singular fact, that in the whole range of animal organization, embraced in the three principal grand divisions, viz.: the vertebrata, articulata and mollusca, no example can be found of Prof. MacIise’s ideal of whole archetypal quantity, except in some of the genera of double malformations. In many of the forms of the radiate animals, double bisection will produce equal halves and equal fourths.

The term *Ischiopagus symmetros* is restricted to the typical cases in which each component body is well developed; all other varieties, in which defective formation is found in either or both of the component bodies, will be included under the general term *Ischiopagus asymmetros*, of which several species will be defined, viz.: *I. tetrapus*, *I. tripus*, *I. dipus*, *I. dipygus*. The latter to be subdivided into two varieties.

The species *I. tetrapus* embraces all cases in which one or both individuals are defective, having usually two heads and four thoracic, but invariably four distinct pelvic extremities. Figs. 23–32.

The *I. tripus* includes the cases in which two pelvic extremities are developed on one side of the common vertebral axis, and one on the opposite side, which is always a double limb. Figs. 33–37.

The species *I. dipus* comprises the cases in which only two pelvic extremities are developed, both of which are situated on one side of the common longitudinal axis. Fig. 38.

Ischiopagus dipygus is a species in which one body is entire, the other being so far arrested in its development that only two, and sometimes only one pelvic extremity is found attached to the pubic region of the main body. In these cases two sets of genitals are developed, situated on either side

* “Comparative Osteology, being Morphological Studies to demonstrate the Archetype Skeleton of Vertebrate Animals.” Fol. London, 1847.

of the vertebral axis, between one of the well formed limbs and the corresponding portion of the defective one. Figs. 39-44.

Where two supernumerary extremities are thus attached to the pubes, the case is designated *I. dipygus tetrapus*. Where the limb is single or compound it is denominated *I. dipygus tripus*.

The non-symmetrical Ischiopagi furnish many remarkable examples of the operation of the law of symmetrical development. In cases where two pelvic extremities occur on one side of the vertebral axis, with none upon the other, the two limbs are perfectly symmetrical in form and size, though one belongs to each individual. Fig. 38. The same law holds in cases where there are four pelvic extremities, a pair on each side of the common axis, occurring in Ischiopagi composed of two very unequal bodies. The right and left members of each lateral pair are, nevertheless, in every respect symmetrical (Fig. 31). Other examples of the law of symmetrical balancing of parts in homologous union will be found in several of the genera of compound monsters.

The genitals are seldom equally developed on both sides of the vertebral axis. In rare cases the external genitals are united at the back, or under the nates, as seen in Fig. 23. In the tripod species, a single set of genitals is found, which is situated between the well formed pair of extremities.

In most instances the vertebral columns are merely in contact at the coccygeal or sacral extremities, while in others they are so intimately fused that the spinal cords are confluent, as shown in Fig. 32.

The Ischiopagi, in a series of cases, present a variety of malformations, such as are found in single bodies, as acrania, hare-lip, atresia of the ureters, urethræ and recti, and numerous other examples of defective development.

It is chiefly owing to these defects, more particularly to the frequent occurrence of atresia or imperforation of the normal openings of the recti and genito-urinary organs, that the Ischiopagi are so unlikely to live for any length of time. It is, however, remarkable, in view of the general perfection of their organization, the nervous, respiratory, circulatory, and digestive systems being normally developed, that in the higher degrees of its development, no cases are on record of a monster of this genus having attained adult age. Most of the Ischiopagi are born prematurely, seldom reaching beyond the seventh or eighth month of gestation. Of those born living nearly all die during the first week. Their delivery in most cases is natural and unattended by danger to either mother or offspring.

The Ischiopagi are comparatively rare; they occur more frequently in man than in the lower animals. Twenty human cases have been noted by Förster, of which four were males, and eleven females; in the remaining seven the sex was not ascertained. Gurlt mentions one case in a calf, and refers to four others which he considered to rest on imperfect evidence, or equivocal authority.

CASE 25. *Ischiopagus symmetros*.

[MONTGOMERY, "On Double Monsters," *Dublin Quar. Jour. of Med. Sci.*, vol. xv, 1853. Pl. 1, Fig. 2, p. 263.]

I have copied Dr. Montgomery's account of the "Double Child born at Boyle," which is nearly as symmetrical as most of the cases on record.

It consisted of two bodies in a direct line, united at the pelvis. The mother, Catharine Corcoran, resident at Boyle, County Roscommon, was a very healthy woman, thirty years of age, and previously to giving birth to this monster, had borne five well formed children, no two of which were twins. In this instance her labor was not attended with any unusual difficulty. This monster was born on the 24th of July, 1827, at two o'clock A. M., and lived until the 26th, at two o'clock P. M., being two and a half days. It appeared to have nearly reached the full period of nine months. It had a head at either extremity; two chests, with arms complete; two abdominal and two pelvic cavities, united end to end, with four legs, placed two at either side, where the union between the pelvis occurred, as in Fig. 15. There was only one anus, situated between the thighs of one side, and on the same side the urinary bladder opened above the pubis; there was only one placenta, and one umbilical cord which entered at the unnatural opening from which the urine was discharged.

"The infants were baptized as two. One, having dark hair, was named Mary; the other, fair-haired, was called Catharine; and each, in its feelings and actions, appeared independent of the other; sometimes both cried together; at other times one cried, while the other remained tranquil, but generally they were both disposed to be quiet, unless when excited by exposure to cold air in gratifying the curiosity of neighbors; and it would appear that the gratification of this curiosity was the principal cause of their untimely death. They each in succession sucked from the breast, and each in like manner frequently took milk from a spoon; they both vomited very often, and the act of vomiting in one was not always attended with similar disturbance in the other; their fæces were discharged from a common opening, and the urine of both flowed from the same imperfect bladder. They both used their limbs very vigorously, and the feet of one were extended along the sides into the arm-pits of the other. Life departed from Mary about ten minutes before the death of Catharine.

Skeleton.—The heads, upper extremities, and chests of both fœtuses were perfect and equal in size; all the bones constituting the pelvis were well developed, but joined together in a curious manner; the coccyges overlapped each other laterally, and in the recent state the spinal marrow was continued from the extremity of one sacrum into that of the other, making an inseparable union at this point. The pubic bones were united by symphyses, but not in the usual way; the left pubis of one fœtus was joined to the right pubis of the other on one side, and *vice versa* on the opposite side; the thigh bones, which were articulated, two on each side, to these pelvises, belonged, of course, to their respective fœtuses. The arrangement of the skeleton was such, that if the coccyges had been separated, and the pubes disunited at their unnatural symphyses, a perfect pelvis and two perfect lower limbs might, by a new arrangement, have been formed for each infant.*

I may observe that this case is taken by Prof. Vrolik as the type of a class, 'Inferior Duplicity,' and the figure of it in my article, 'Fœtus,' in the *Cyclopædia of Anatomy and Physiology*, vol. II., fig. 146, is referred to by him as an illustration."

CASE 26. *Ischiopagus symmetros*. FIGS. 15 TO 19, 21 AND 22.

[PALFYN, *Descript. anat. de deux Enfants, etc.* Tab. I., figs. 1, 2. Tab. II., figs. 1, 2. Tab. III., figs. 1, 2. Vide LICETUS "*De Monstris*," appendix par J. Palfyn. Leide, 1708.]

This monster was born in the city of Ghent, the capital of Flanders, April 28th, 1703. The labor was natural. Each head was separately baptized.

* See Catalogue of the Museum of the Royal College of Surgeons of Ireland, vol. 1, p. 148.

One child was more robust than the other. The feeble one lived twenty-seven hours. The stronger is said to have survived the weaker two hours.

The engravings (Figs. 15, 17) will give the reader a correct idea of the relation of the bodies and their extremities.

The sex is feminine. Both bodies well formed; vulva complete on one side, rudimentary on the other. All the bones of the pelvis complete, and so attached as to form a large osseous ring, or common basin. Fig. 22.

There is but one anus, which is situated on the side with the more completely developed external genitals. The following explanation of the figures will take the place of a detailed description of the case:

Fig. 16, a, b, livers; *c, d*, stomachs; *e, f*, jejunæ; *g*, line of union of the two peritoneums; *h*, umbilicus; *i, k*, umbilical veins; *l, l, m*, umbilical arteries; *n*, urachus; *o*, bladder common to both; *p, q*, colons; *r, s*, two double uteri; *t, t, v, v*, round ligaments; *w, w, x, x*, Fallopian tubes and ovaries; *y, z*, kidneys.

Fig. 18, a, a, b, b, double uteri; *c, c, d, d*, round ligaments; *e, e, f, f*, Fallopian tubes; *g, g*, ovaries; *h, i*, vaginas; *l*, well formed vagina; *m*, orifice of ditto; *j*, urethra; *o*, bladder laid open; *p, p, p*, ureters; *k, k*, rectums; *n*, common external orifice of the rectum.

Fig. 19, a, a, a, a, double uteri; *c*, single vagina of the right duplex uterus, laid open to show the uterine orifices *b, b*; *d, d*, vaginas laid open to exhibit the cervix of each of the uteri *b, b*; *e*, partition of the two vaginas of the upper individual (Fig. 15); *h, i, k*, orifices of the vaginas as they open into the lateral vagina which leads to the left lateral genitals in figure 15, which are well developed; *m, m*, rectums; *g*, the urethra which passes to the opposite side, where it opens externally, there being no lateral vagina, and only very imperfect external genitals. The rectum is also wanting on this side, and consequently no anus. The livers are distinct; the abdomens separated by two layers of peritoneum.

Fig. 21. The pelvis of the above described case. An osseous mass is seen between the sacral bones at their lower margins in the figure, which may be an adventitious deposit, or a mere fusion of the posterior portions of the iliac crests, in consequence of their closer proximity on the less perfectly developed side of the vertebral axis.

CASE 27. *Ischiopagus symmetros.*

[GEOFFROY SAINT-HILAIRE. *Comptes Rendus de l'Académie Royale des Sciences. Tome, IX, second semestre. 1839.*]

This account is illustrated by two fine lithographic engravings, exhibiting the external configuration, anteriorly and posteriorly.

Born in Prunay-sous-Ablis, Oct. 7th, 1838, died at Paris on the 8th of Nov. following, aged thirty-one days. Sex female. The Royal Academy of Paris appointed a commission, consisting of M. M. Serres, Breschet, and Geoff. St. Hilaire, who went to Prunay to investigate the case and report to the Academy.

The symmetrical balancement of the external parts of the united bodies was remarkably perfect. The component individuals were separately baptized, one being christened Marie-Louise, the other Hortense-Honorine. They attracted public attention to such an extent that multitudes of people flocked from all quarters to see them; the cupidity of the parents encouraged the exhibition of the children. As no law protected the monster, the parents were allowed to take them to Paris to gratify the public curiosity; many eager showmen endeavored to make engagements for different places and times.

Their lives were sacrificed to the exposures to which they were subjected. All the functions of their bodies were well performed; and the

chances for continued life, under favorable circumstances, were thought by the commission to be good.

There are no further details connected with the history or structure of this case, which are peculiar or specially worthy of mention.

CASE 28. *Ischiopagus symmetros*. Figs. 22, 23, 24.

[DUVERNEY. *Hist. de l'Acad. des Sci. Ann.* 1706, p. 418.]

The subject of this case was born in Vitry-sur-Seine, near Paris. It survived its birth seven days. One of the component children is stated to have died three hours previous to the other. Sex male.

Fig. 24 represents the abdominal aspect. The heads, extremities, and upper portion of the trunks, were well formed. An internal inspection revealed the following interesting facts:

The two ilia were united before reaching the colon. There were two cæca, between which the common ilium entered the colon, which was single and short, and terminated in the urinary bladder. In consequence of the peculiar termination of the colon, neither rectum nor anus existed. The bladder, as in most cases of true Ischiopagi, is common to both, being formed by the junction of two, corresponding with the plan of junction of the pelvis, &c. From each side of the common bladder a urethra passes off through the corresponding penis. The testes and seminal ducts were well formed. The pelvic bones of each were so united as to form a large basin or ring, as seen in Fig. 22.

Fig. 23 represents the dorsal surface of the body, showing the singular contiguity of the scrota and penes of the two component bodies.

Obs.—This is due to the defective development of the perineal region. No anus being formed, the external genitals necessarily approached from either side so as to be in contact. A step further would have resulted in coalition of the genitals, in such a way as to produce a single penis, composed of four cavernous bodies, and a single urethra, surrounded at the base with a scrotum containing four testes. I am not aware that such a case has ever been seen, yet its occurrence is by no means impossible.

Fig. 24 represents the abdominal region, and the relation of the pelvic extremities to the body. The umbilicus can be seen in the center of the abdomen.

CASE 29. *Ischiopagus symmetros*.

[ALEX THOMPSON. *Lond. & Edinburgh Monthly Jour. of Med. Sci.*, vol. V, p. 639, 1844.]

Prof. Thompson refers to the following case, which he states was in the possession of Dr. Wm. Campbell of Edinburgh.

It is "a very perfect example of Ischiadelphic double monstrosity, in which two equally developed fetuses are united by the lower part of the trunk as far as the common umbilicus; the pelvis being common, and apparently composed, as in other examples of the same kind, of the parts of both individuals."

In this highly interesting example, as it has not yet been fully dissected or described, I shall only state, that there is not *situs inversus* of the non-symmetrical organs, at least of the heart, stomach, spleen and liver, in either of the individuals composing it."

CASE 30. *Ischiopagus* (?) FIG. 25.

[ALCOCK. *Dublin Med. & Phys. Essays*, vol. II, p. 33, quoted by MONTGOMERY, in *Dub. Quart. Jour. of Med. Sci.*, vol. XV, 1853, p. 262. Pl. 1, fig. 1.]

Obs.—This case, copied from the latter work, is introduced here, with

[F.]

the accompanying figure, for the purpose of commenting upon the views of Dr. Montgomery in relation to it, which in my opinion are entirely incorrect, as I also believe the figure to be. These errors, in the supposed relation of parts, the idea of its belonging to the genus *Ischiadelphus*, and the strange figure, (which I have had accurately copied, Fig. 25,) have undoubtedly resulted from the mutilation of the body in delivery, the very defective examination, (no post-mortem having been permitted) and the brief and unsatisfactory account which Dr. Alcock has given in his report of the case.

“Thomastown Case.—Complete Double Child.”

“Sunday, Jan. 3d, 1808, Dr. Alcock of Kilkenny was called to visit Mary Cahill, aged 30, in labor, with her third child, since Friday; she had, in each of her former labors, one perfect child. He found a child's head born, and had been so from the evening before, but no further progress was making, though the labor had been severe all night; the woman was much exhausted, two robust midwives having freely used their united exertions to pull away the child. Dr. Alcock brought down the arms without much difficulty; but found the rest of the body quite immovable, and soon discovered a third arm apparently growing from the same body; this disclosed the nature of the case, and convinced Dr. A. that the only chance of delivery was to remove as much of the presenting part as could be got at, return the remainder, and bring down the feet of the second child.

Dr. A. procured the assistance of Dr. Pack, who divided the body of the presenting child between the diaphragm and stomach, which was, as afterwards appeared, exactly where the union with the second child commenced. The second child was then turned, and the remainder brought away. The placenta soon followed, and all seemed as well as could be expected; but the woman was seized with vomiting in the course of the night, and died before morning.

No examination of the child could be obtained; the bodies were placed at right angles to each other, and they had a common abdomen; there was but one umbilical cord, which sprang from the centre of the abdomen; the placenta was such as is usual with a single child.”

The sex is not mentioned.

Obs.—The anatomical description of this case, as given above, barely states that the bodies were united below the diaphragm, that they had a common abdomen, with one funis and umbilicus; and adds the remark that “the bodies were *placed* at right angles with each other.”

After a careful consideration of the figure and the description, I am fully persuaded that this was a case of what is described in another portion of this essay under the head of *Omphalopagus gastrodidymus*, in which the bodies are fused by the abdomens, the chests remaining free. The bodies, in this species, when placed in their proper relations, are face to face.

It is easy to comprehend that the head of one individual presenting, it, with the corresponding arms and chest, could be delivered, while the same parts of the other were retained in the uterus. The amputation of this body at the diaphragm would then readily admit of the delivery of the remainder.

By reference to Fig. 25, it will be seen, that if the arms of both individuals were dropped, the two between the heads falling behind the bodies, the others in front; and that if the lower extremities were brought down together instead of being sprawled out as in the figure, and the faces and

anterior portions of the trunks were inclined to each other, the bodies would then occupy the ordinary relative positions which occur in the common form of double monster above referred to, the two portions of which are joined anteriorly by the abdomen.

A monster such as is represented in the figure is an anatomical puzzle, and in my opinion an impossibility. The explanation which I have given does not conflict with any of the statements made in the report of the case; on the contrary, it furnishes a rational key to this otherwise inexplicable case. I think the bodies did not cross each other, as would appear by the representation. The two perpendicular pelvic extremities, seen in the figure, belong to the horizontal body on the right hand, and *vice versa* with the horizontal legs on the left hand. The vertebral columns do not decussate, they are merely bent towards each other. The flaccid state of the fetuses, especially after cutting one body across, and opening the common abdomen, as was done to effect delivery, would favor any position in which one might be pleased to place them. A line drawn from *a* to *b*, passing through the umbilicus, indicates, in my opinion, the axis of coalition.

ISCHIOPAGUS ASYMMETROS.

The incomplete forms of *Ischiopagus* may be included under four specific groups, designated according to the number and position of the pelvic extremities which are developed in each.

In all the forms embraced under this head, one or both of the component bodies are imperfectly developed. Some of the cases possess bilateral symmetry in relation both to the common vertebral axis, and the axis of coalition, but in most instances there is an unequal balancing of parts in relation to the median line of fusion. This want of bilateral or polar symmetry is, however, only true in regard to the component bodies taken as a whole, while in relation to the structures which lie in immediate juxtaposition on the two sides of the axis of coalescence, the equal balancing of parts holds with a constancy equivalent to a law.

This observation is exemplified in Figs. 30 and 31, in which the bodies are very unequal, yet the pelvic extremities are perfectly symmetrical.

No further general observations will be made in this place, as they will be more readily comprehended when made in connection with the cases given in illustration of the following species, the distinctive diagnostic characters of which are here briefly indicated:

1. *Ischiopagus tetrapus*. Two bodies, one or both of which are more or less imperfectly developed, united at the pelves, having a common vertebral axis, four pelvic extremities, arranged in lateral pairs, with corresponding genitals, &c. Figs. 26-32.

2. *Ischiopagus tripus*. Two more or less complete bodies, united as in the above species, having three pelvic extremities, one lateral pair with corresponding genitals, and a single or fused pelvic extremity on the opposite side of the common vertebral axis, with no genitals. Figs. 33, 35-37.

3. *Ischiopagus dipus*. Same as in the last, except that only two pelvic extremities exist, both of which are on one side of the common axis. One set of genitals. Fig. 38.

4. *Ischiopagus dipygus*. A single well formed individual, with one fused,

or two distinct supernumerary lower extremities attached to the pubes, or engrafted by the insertion of a rudimentary pelvis between the pubic bones of the main body. Two lateral sets of genitals. Figs. 39-44.

SPECIES I. ISCHIOPAGUS TETRAPUS.

Figs. 26-32 and 34.

Derivation.—From *Τετρα*, 'four,' and *πούς*, 'foot.'

General Characters.—Two individuals, one or both of which are more or less defective in their development, united, on a common longitudinal or vertebral axis, by a right and a left lateral symphysis pubis, common to both; four pelvic extremities, arranged in lateral pairs, with corresponding genitals; either one or two bladders, &c.

In its higher degrees it is only distinguished from the typical or symmetrical form of the genus by some obvious deviation from the normal structure, or external configuration of one or both of the component bodies; for example, hemicrania, cyclopia, &c.

The cases included in this species vary from a mere difference in the size of the component bodies, or an arrest of development in a part, as above mentioned, to those cases in which the body of one individual is almost entirely wanting; and little more is found in its place than a shapeless mass, from which are developed two pelvic extremities, which are symmetrical with the corresponding ones of the well formed body; and also, generally, two thoracic extremities, which are more or less perfect. Figs. 30 and 31.

The peculiarities observed in the several degrees are more fully detailed in the history of the following cases:

CASE 31. *Ischiopagus tetrapus*. Figs. 26-29.

SYN. *Ischiadelphæ dérencéphalique*.

[DUBRUEIL. *Mém. du Mus. d'Hist. Nat.*, 1827. *Tom. XV. Pl. 5, p. 245.*]

This specimen had been preserved in the anatomical museum of Montpellier for sixteen years, when Dabruceil dissected it and published the results of his examination. The fœtus had reached the eighth month of gestation; the skin was white, and remarkably hairy; the length, from vertex to vertex, was ten inches, from heel to heel, eleven inches. One body (A) was somewhat larger than the other (B); both were anencephalous. Sex male, genitals normal. Single anus, common to both, separated from the genitals by a perineum. The abdomens were separated by a thick transverse partition, enclosing in its walls a flattened wide triangular bladder, extending from one symphysis to the other. Single urachus. Two well formed urethras. Two ureters for the body A, and one for the body B, which had no left ureter or kidney. No supra-renal capsules. The right kidney of A, was in the pelvis, and had a flexuous ureter. The individual rectums were placed transversely, under the bladder, and terminated in a common rectum only half an inch long. The funis had four vessels—two arteries and two veins. No trace of brain, both hemicranial.* The fœtus A, had spina bifida, including all the cervical, and the first three dorsal vertebral laminae. The fœtus B, had spina bifida in the cervical vertebræ only. Each fœtus had twenty-six ribs, thirteen on each side.

Fig. 26, is a front view of Dubruceil's case of "*Ischiadelphæ dérencéphalique*."

* *Dérencéphale*, of M. Geoffrey Saint Hilaire.

Fig. 27. Back view, showing the projecting mass covered with hair, characteristic of *Derencephalus*.

Fig. 28. Skeleton. Fig. 29. Lateral view.

We have in this case a remarkable combination of malformations, a sort of museum of teratology; absence of cranium and brain, spina bifida, absence of a kidney, of supra-renal capsules, one kidney in the pelvis, and a supernumerary rib on both sides of each individual.

CASE 32. *Ischiopagus tetrapus*. FIG. 30.

[KNAUZ. *Ueber Doppelmissbildungen*. Inaug. Dissertation. Marburg, 1856. 8 vo., pp. 26. *Mit einer Abbildung*.]

The subject of this case was presented by Dr. Neuber, of Cassel, to the Anatomical Institute of Marburg. It was the product of the third pregnancy, two previous children having been normal. The monster had arrived at full term. It was delivered with some difficulty, requiring the aid of a blunt-hook, to which cause its death was attributed. Mother recovered well.

An inspection of Fig. 30 will give the reader a more correct idea of the external configuration than a detailed account.

One of the heads (A), with its trunk, and all of the eight extremities are well formed. The head (B) and corresponding trunk are defectively developed. The sex is male, the external genitals are normal, with the exception that one of the scrotums contains but a single testicle. They are not seen in the figure, which represents the dorsal aspect. A right and left anus is shown, which, as represented in the engraving, might easily be mistaken for female genitals. At the central part of the spine is a sac (a) filled with fluid, which is probably connected with *spina bifida*.

The lower, or imperfect body, (B) is smaller, and covered with an envelope resembling the serous membranes; it is not, however, derived from the placental membranes. The abdominal walls are deficient, their place being supplied by a membrane, which consists of an abnormally developed or hypertrophied peritoneum. The thoracic viscera of the upper body are all normal. There is a large liver, with one gall-cyst. The intestine remains single until it reaches the cœcum, where it divides into two canals, which pass to the anus of either side.

The lower body, as previously mentioned, is enveloped in a thick sort of serous membrane, the head being included in a sac of the same tissue. There is no sternum, and no clavicles; there are twelve ribs on each side, with cartilaginous continuations; the anterior parietes of the thorax are completed by the membrane referred to.

There is one funis, as in all cases of *Ischiopagus*. The umbilical artery, before entering the abdomen, divides, giving one large branch, which enters the right pelvis, to be distributed as the hypogastric; the smaller branch runs along the spinal column, following the course of the abdominal aorta, to supply the mesentery, which is here attached. A large branch goes to the left pelvis, where it is divided in the ordinary manner; it then passes the line of junction and enters the thoracic cavity of the smaller body, and here acts as a descending aorta, supplying intercostal arteries from either side; it divides at the second dorsal vertebra into three branches, the larger one to make the right and left subclavians, while the middle and smaller one extends into the serous sac, or head cap. The blood vessels of the principal body are normal.

The more complete body had two kidneys; the smaller body had one compound or fused kidney. In this case, it is stated that two complete bladders were found.

Below the head cap, on the left, is a rudimentary heart and liver. A small vessel passes off from the upper and lower end of this imperfect

heart, the latter being distributed to the adjacent muscles of the chest, the former to the head-cap and spinal cord.

On removing the serous sac, the head is found covered with thin dark hair, the cranial bones are imperfectly developed, and are widely separated. The left eye is well developed; the right is rudimentary. The face and jaws are wanting. The vertebral columns are continuous and fused, as in the following case. Fig. 31.

CASE 33. *Ischiopagus tetrapus*. Figs. 31, 32, 34.

[MAUNOIR. *Medico-Chirurgical Transactions*. London, 1816. Vol. VII, p. 257, Pl. III, Figs. 1-5.]

This case, in many respects, resembles the last. The history and illustrations were communicated to the Royal Med. Chir. Soc. of London, through Dr. Marcet, Jan. 23d, 1816, from Prof. Maunoir, of Geneva.

The child was born in the early part of the year 1815, the mother being between sixteen and seventeen years of age; it lived for a few minutes only. The delivery was natural and easy. Figure 31 gives a correct idea of the external configuration. Sex female. One head is well formed, the other being rudimentary. Four pelvic and four pectoral extremities, all of which are well developed. Single circulatory system, one heart, and one set of respiratory organs, all belonging to the body A. In B, the thorax is entirely wanting. The aorta passes from the heart through the diaphragm; it then divides into three branches. The left, which is the largest branch, produces the iliac arteries of the left pelvis and its extremities, and then continues in order to form a large umbilical artery—the only one existing. The right branch supplies the right pelvis and its extremities. The middle branch runs along the spine of the imperfect body, and divides into two vessels, which serve as arteriæ innominate; each produces a small carotid, which passes along the imperfect neck, and also a subclavian artery, which is distributed to the corresponding pectoral extremity of the imperfect body B.

There is only one complete set of digestive apparatus. The alimentary canal continues from the mouth of A, to the anus situated on the left side of the common axis. About the middle of its length the ileum gives off a branch of intestine, which proceeds until it terminates in a kind of cloaca, or sac, corresponding with the head B, and constituting the whole of its cavity. Two inches farther, the ileum bifurcates to form on each side a cœcum, each of which is continued into a colon and a rectum. The rectum on the left side opens by the only anus which is found in this monster. The right rectum, which was prodigiously distended with meconium, terminates by an imperforate bag near the fundus of the right uterus. (Fig. 34, *k*.)

On opening the cloaca, it was found to contain the rudiments of a lower jaw, and of a tongue, which were immersed in the meconium with which this cavity was filled. The left uterus, on which the left rectum reposed, is fully developed, and its bulk is at least double that of the right. The external organs of generation appear to be complete. A urinary bladder is found on each side. There are two kidneys, which are abnormally large, and appear to be each composed of two; the left (Fig. 34, *p*.) has two ureters, the right (Fig. 34, *o*.) has one ureter.

The head B had a large sac or bladder growing upon it, filled with a clot of blood; it had been cut off, from an idea that it was of no importance. This head presents an appearance of scalp covered with hair, and a cartilaginous body of an irregular form, which appears to be the rudiment of an external ear. The liver is large, but single. Abdominal parietes very deficient, and to some extent entirely wanting. The umbilical cord single.

Fig. 34 illustrates the viscera: *a*, the stomach; *b*, small intestines; *c*, an

intestinal tube branching off from the ileum in order to form the opening of *d*, the cloaca, in which the rudiments of a tongue and jaw are seen at *f, f*; *g*, bifurcation of the ileum, giving rise to two cæca at *h, h*; *i*, right colon, which is continued into a rectum in *k*; *k*, rectum terminating at the top of the uterus *l*; as it ends in a *cul-de-sac*, the meconium, having no exit, had accumulated and given to it a considerable volume. The uterus on this side is at least as large again as that on the opposite side. The left cæcum is continued into the colon *m*, and the rectum *n*, which passes behind the uterus, and terminates in an anus; *o, p*, the kidneys, the left having two ureters.

FIG. 32 is a posterior view with the spinal canal laid open, and shows the medulla spinalis proceeding from one spine to the other, and the mode in which the nerves are distributed from it to the two pelves and their corresponding extremities; *a*, the termination of the vertebral column of the more complete body; *b*, ditto of the defective body; *c, c*, the spinal cord crossing from one to the other; *d, d, d, d*, nerves supplying the pelves and extremities; *e, f*, the two pelves.

The development and structure of this monster appears to have been very incomprehensible to the reporters, as is clearly indicated by the following extract from their account of the case.

“The occurrence of a double fœtus, of which the formation cannot be accounted for, unless by supposing each to have undergone some great mutilation prior to the period at which they were united, and the union of the dismembered parts to have taken place at random, is a phenomenon which hitherto stands alone in the history of monsters. Its explanation, if not impossible, is at least extremely difficult; but if obtained, it would probably throw new light on the mysterious process of conception.”

“In the monster of which I have the honor of transmitting a description and drawings to the Society, this curious and unprecedented combination of circumstances is found to be realized.”

The plan of organization and the anatomical relations are much the same in all the varieties of Ischiopagus, of which cases had been described long previous to the date of Prof. Maunoir's case.

CASE 34. *Ischiopagus tetrapus*.

[TIEDEMANN. *Zeitschr. für Phys.* Bd. III, S. 6. Taf. 3, 4. See Förster op. cit. Pl. II, fig. 6, 7.]

This case resembles the two last in most respects. Male. One body well developed, the other very defective, having only arms, legs and a headless body. The liver, spleen, pancreas, and stomach of the well developed body are all normal. The ileum begins single, but afterwards bifurcates and enters two distinct colons, each of which terminates in a well formed rectum and anus. Four kidneys, four ureters, and two bladders. The testicles are in the abdomen, one below each kidney.

The aorta of the principal body divides into two branches, after giving off the superior mesenteric artery; it supplies branches to all the kidneys, and the inferior mesenteric artery, and to all the pelvic extremities, &c. In the rudimentary body is found a small heart, composed of an auricle and ventricle; from the latter an aorta arises, which gives off a brachial artery on each side; it then follows down the vertebral column, supplying small intercostals, and finally joins both branches of the aorta of the principal body. The veins are distributed in a corresponding manner.

The spinal cords are fused at the junction of the bodies. The nerves from either side of the continuous spinal cord pass to the pelves and their

extremities. The incomplete body has some cervical and dorsal vertebræ; the ribs are small, and no sternum is developed.

SPECIES 2. ISCHIOPAGUS TRIPUS.

Figs. 33, 35-37.

Derivation.—From *τρι*, 'three,' and *πούς*, 'foot.'

Synonyms.—*Ischiadelphie tripode.* *Dubreuil.*

General Characters.—Two more or less complete bodies, united as in the last species, but having only three pelvic extremities, which are arranged as follows: a lateral pair, with corresponding genitals on one side of the common vertebral axis; and, on the other, a single or compound limb, consisting of two, which are more or less fused, with no external genitals. Figs. 33, 35.

The pelvic bones on the side of the single or fused limb are always defective, and sometimes consist of a mere amorphous mass. The coalescence of the extremities may be very superficial, as seen in Fig. 33, or so intimate as to consolidate the bones into a single shaft. The corresponding parts, the genito-urinary apparatus, the rectum, &c., are relatively defective.

It is not difficult to comprehend, or irrational to suppose, that cases may yet occur, though none are known ever to have existed, in which two fused limbs may be developed, one on either side of the common axis; or even cases, in which two bodies may be united on a common vertebral axis, without any pelvic extremities being developed. It merely requires for this purpose an equal balancing of the arrested development on both sides of the common axis, which is seen on one side only, in the cases represented in Fig. 35 and Fig. 38.

CASE 35. *Ischiopagus tripus.* FIG. 33.

This case is reported by J. W. Falek, Governor of Ceylon,* who does not attempt to name or classify it. He states that the monster was born in Anjenga, in the southern part of Malabar. It lived four or five days; the sex was female; the heads and trunks were well formed. Each mouth nursed the mother equally well. It often occurred that one individual slept while the other remained awake, etc. It is further stated that one died a day previous to the other. No further particulars relating to its history, or details concerning its anatomical structure are given; the reporter refers to the figure, as conveying a better notion of its conformation than any lengthened account which he could furnish.

Figure 33—is a faithful copy, reduced one half, from the original engraving accompanying the account of Falek. It presents a remarkable peculiarity in the mode of fusion of the pelvic extremities, which I have never met with in any other case. The lateral pairs of pelvic extremities, both distinct and fused, do not occupy the usual relation of juxtaposition by their normal proximal surfaces; this is probably owing to a slight obliquity in the axis of coalition. Each individual appears to straddle the

* The case is published in an old Dutch anatomical and pathological work, apparently the Transactions of a society, the title and date of which I am unable to give, as the portion of the work containing the description of the case, and a plate, (which I have copied,) have been detached and covered as a pamphlet, and in this condition sent to me from Amsterdam, Holland.

perineum of the other; *c* and *d* are the extremities of A, while *a* and *b* belong to B. This is the only explanation I am able to give. It is possible that the original artist may not have placed the limbs in their correct relations, or that he may have been careless in the minute details of his sketch; however, it would appear that the compound limb must have resulted from the fusion of two extremities by their outer surfaces, and that the distinct pair were correspondingly placed. What the projecting mass, seen at *e*, may be, is left to conjecture. There are no reference-letters in the original engraving, which Gov. Falck assures us is accurate. The fusion of the symphyseal extremity appears to be very superficial, and principally integumentary, as the feet are somewhat separated, and a shaded furrow marks the double thighs, knees and legs.

CASE 36. *Ischiopagus tripus*. FIGS. 35-37.

[FRANCISCO XAVIER LASO. *Sec. Por una Comision de la Sociedad Médico-Quirúrgica de Cadiz, Año de 1818.*]

This double malformation was born at Cadiz, in Spain, May 30th, 1818. The mother, Antonia Fernandez, thirty years of age, having a good constitution, produced the subject of this case, as the result of her fifth pregnancy, and after a natural labor of six hours duration. The placenta was large, but single, as was also the funis.

Each child received baptism on the day of the birth, in the Cathedral of Cadiz.

They died on the fourth day of June, having lived five days and ten hours. One is said to have expired three minutes previous to the other.

Figures 35 and 37 will take the place of a particular description of the external appearance. Sex female. Both individuals nursed the mother. The feces were evacuated several times from the very large but only anus, which, with the corresponding genitals, was situated on the side of the two distinct pelvic extremities. The circulation of the blood was observed during life to be independent in each. The child 'A' was much more feeble than 'B.' 'A' had internal Hydrocephalus, she also had several convulsions, which did not appear to affect 'B.' Two tumors were found, one below the angle of the jaw of each subject, which are seen in the figure. The component parts of the single limb were very intimately fused, no patellas were found; it terminated in ten toes, three of which were united on one side. No trace of sex could be found on the imperfect side of the common axis, except a wart-like excrescence under the pubes which is shown in Fig. 35. The thorax of 'A' was larger than that of 'B.'

The abdomens were separated by a double peritoneal partition. The right kidney of 'B' was normal, the left kidney was atrophied and had no ureter. The left kidney of 'A' was larger than the normal size, its ureter after passing behind the Fallopian tube terminated in the rectum; the right kidney was normal, its ureter terminated in the uterus. The vertebral columns were connected together, as seen in Fig. 36, which though a poor sketch of the skeleton, is a great improvement of the rough original engraving accompanying the report.

This case was first published by the Commission of the Medico-Chirurgical Society of Cadiz, 1818, and translated from the Spanish into French and republished in the Transactions of the Medical Society of Tours, in 1827. It is also refigured and described by Prof. Dubrueil, under the name of *Ischiadelphie tripode*, in the *Mémoires du Muséum d'Hist. Nat.* Tom. XV. Pl. V., fig. 6. I mention these several references to the Cadiz case, to pre-

vent the possibility of their being again mistaken for different cases, as has previously occurred.

CASE 37. *Ischiopagus tripus*.

[PROCHASKA. *Abhandl. der Böhm. Gesellsch. der Wissensch. f.* 1786. s. 281.]
(Vide Förster, *Taf. II. Fig. 8.*)

Females. The extremities of the sacra are united. On one side of the common vertebral axis, the pelvic bones and corresponding extremities are well developed; on the opposite side the pelvic bones constitute a fused mass, from which proceeds a single limb. This contains a broad femur, deeply furrowed in the median line, two tibiæ, and one fibula with a spur-like cartilaginous continuation at the lower end. The limb terminates in a five-toed foot. The umbilical cord contained two arteries and two veins. As necessarily occurs in these cases, only one rectum, one bladder, one vagina, and one set of external genitals are developed, the lateral halves of which are contributed equally by the two individuals.

CASE 38. *Ischiopagus tripus*.

[CONRAD LYCOSTHENES. *Prodigiorum ac Ostentorum Chronicon, etc.*, 1557, p. 619.]

Lycosthenes figures and describes a case of double malformation similar to the above cases, which, he says, was born near Oxford, in England, on the third of August, 1552, only five years previous to the publication of his curious work on Prodigies. It is undoubtedly authentic, as it corresponds in every particular with modern cases. The sex was female. The case is copied and figured by Licetus.*

My attention has recently been called to a curious case reported by Dr. Leverett Hubbard, and published in a work entitled *Cases and Observations by the Medical Society of New Haven County, in the State of Connecticut, Instituted in the year 1784, 12 mo. New Haven, 1788*, p. 38, with a wood-cut. The case occurred in 1786, a foetus at the sixth month of gestation, one well formed head, chest, and pair of upper extremities, and two pelvic extremities; at the opposite pole of the common longitudinal axis another head, very imperfectly developed, though as large as the well formed one, was found attached to the perineum of the main body by a large neck, or imperfect body, in the manner of other nonsymmetrical Ischiopagi. This head and body were so rudimentary that no organs nor extremities were developed. The reporter says, "I shall next proceed to the thighs; the end of the os femoris was rather flat than round, no os innominatum, but a ligament formed, fastened to the vertebræ immediately below the last true ribs, the ligament being about an inch long, gave liberty for the thighs and legs to move freely." * * * * "The left leg was flat, having two tibiae and two fibulas, articulated about half way from the patella to the ankle." The number of toes, the condition of the other leg and foot, and several other important details are omitted in the report, for which the Dr. apologizes by saying "I should have proceeded further in my dissection and enquiry, but was suddenly called off."

The accompanying wood-cut is very rude, and unsatisfactory. I have no doubt that this is a case of the unsymmetrical Ischiopagus, in which the pelvis being defective, the extremities were fused on either side of the vertebral axis, as the double set of leg-bones on one side, and the flattened

femur on the other clearly indicate. In such a case, no external genitals could be developed, and we accordingly find none mentioned or figured.

It is possible that other cases similar to this may occur in future, which, if reported with care, will render it necessary to modify the classification by defining a new species for their reception, which I do not think is at present required.

SPECIES 3. ISCHIOPAGUS DIPUS.

Fig. 38.

Derivation.—From $\delta\iota$, 'two,' and $\pi\acute{o}\upsilon\varsigma$, 'foot.'

General Characters.—Two bodies united by their pelves, and abdomens, having a common longitudinal, or vertebral axis, heads at the opposite poles; a pair of pelvic extremities on one side of the common axis, and none upon the other. One set of genitals, etc.

This is a very rare form of double malformation. Two cases only are on record, as far as my knowledge extends. One case is recorded by G. Blasius, in his appendix of recent cases, to the third edition of *Licetus*, ('*De Monstris*,' 1665,) which was born in England the year previous, Oct. 26, 1664; the second case was born in the island of Ceylon, 1841, being one hundred and seventy-seven years after the first. The first, a female, lived two days, the last, a male, two months. The accounts are both illustrated by good engravings. The subjects were remarkably alike. Further details are given in the following history of these cases.

CASE 39. *Ischiopagus dipus*. FIG. 38.

[PEREIRA. *Edinburgh Med. & Surg. Journ.* vol. LXI, p. 58. Pl. 1, Fig. 2, 1844.]

I copy the account entire, as it is quite brief.

"Notice of a Bicephalous and Bisomatous child, born at Galle, in the Island of Ceylon. By J. A. Pereira, Medical Practitioner, Columbo.

"In the year 1841, a monster child was born at Galle, in the Island of Ceylon, of native parents, of which the subjoined sketch is an external delineation. The child was brought from Galle to Columbo, and lived two months. The body was examined after death, by Mr. Pereira, pupil to Mr. Misso, a medical practitioner in Columbo, and subjoined is his account of its internal organs. Considering the limited opportunities afforded to the indigenous inhabitants of Ceylon to acquire a knowledge of human anatomy, the description of the monster is highly creditable not only to Mr. Pereira, but also to his intelligent master, Mr. Misso.

Section Cadaveris.—"Having made a longitudinal incision from the top of one sternum, carried all along the linea alba, crossing the umbilicus, continued to the top of the other sternum, and made a transverse section from the umbilicus down to the pubis, and brought the cavities into view for a superficial examination, there were in each twin, (though the twins were attached,) the heart and its pericardium, blood-vessels, &c., trachea, right and left lungs, the liver and its gall-bladder, œsophagus, stomach, pancreas, spleen, and duodenum; all the rest of the intestines were of one infant. The duodenum of each terminated in a particular manner, so as to end in one jejunum. From the jejunum the ileum, cœcum, colon, and rectum were as of one infant. The twins had one vent or anus, and one male generative organ. The spine, at the lumbar region, had a serpentine curvature internally. There were two kidneys, one situated on each side of the lumbar region, and two ureters descending to the bladder.

(Signed) J. A. PEREIRA.

Columbo, 22d December, 1841.

A view of the appearance of this monster is given in Plate I, Figure 2." (See Fig. 38.)

CASE 40. *Ischiopagus dipus*.

[G. BLASIUS, in the *Appendix to LICETUS*, "*De Monstris*," third edition, Amsterdam, 1665, p. 316, copper-plate.]

Mrs. John Waterman, resident of Fisherton, near the parish of Salisbury, England, gave birth to this biped Ischiopagnus, or "*Monstrum Anglicum*," (as Blasius calls it in his edition of Licetus,) on the 26th day of October, 1664. Sex feminine. The very excellent engraving accompanying the account shows that Pereira's case was precisely like it, except that the former was rather more robust. The compound child lived two days. They did not nurse the mother, but took artificial food at both mouths. They both cried at the same time, and otherwise acted in concert. This remarkable malformation attracted great attention in the region of its birth, and large numbers of the curious flocked in to visit it.

The viscera were normal, except that one set only of genito-urinary organs was developed. At the same accouchement, the birth of this monster was followed by the delivery of a well formed female child, which survived.

SPECIES 4. ISCHIOFAGUS DIPYGUS.

Figs. 39-44.

Derivation.—From $\delta\iota$, 'double,' and $\pi\upsilon\gamma\eta$, 'nates.'

Synonyms.—Ischiopage symélien. *Geoff. Saint-Hilaire*. Pygomeles, Heteradelphia. *Is G. St. Hil and Vrolik*. Heterodidymus. Dipygus. *Gurlt*.

General Characters.—This form of double malformation consists of a well developed body, with one compound, or two distinct supernumerary pelvic extremities attached to the pubes, or engrafted, by the insertion of a rudimentary pelvis, between the symphysis pubis of the principal body. Two lateral sets of genitals.

This is a very rare form of double malformation, both in man and the lower animals.

This species represents the lowest degrees of Ischiopagus. Its relation to the genus will be readily recognized and understood, by tracing a series of transitional forms from the typical or symmetrical Ischiopagus, in which both bodies are equal and complete, through the intermediate degrees, in which one of the component bodies is found to be less and less complete, until no head, chest, thoracic extremities, or abdomen are developed, and nothing remains but the pelvic extremities, separate or fused, and the corresponding genito-urinary organs. It represents the minus proportional of the genus; the difference between it and the type is merely in quantity, and not in kind. It may be easily distinguished from the lower degrees of Pygopagus, not merely by its attachment to the pubic, instead of the sacral or coccygeal region, but by the anterior surface, the knee, toes, &c., of the supernumerary limb, facing the corresponding surfaces of the limbs of the complete body, and the additional characteristic development of two lateral sets of genitals.

CASE 41. *Ischiopagus dipygus*. FIGS. 39-43.

[ACTON. *Medico-Chirurgical Transactions*. London, 1846. Vol. XXIX, p. 102, Pl. IV. Figs. 1, 2. *The Lancet*. (London) Vol. II, p. 124. Figs. 1-4, 1865. (Am. Ed., Jan. 1866, p. 71.)

This case is so remarkable that I have copied the account of Mr. Wm.

Acton, read before the Royal Medical and Chirurgical Society, March 10th, 1846, to which I have added the subsequent history of the case, derived from different sources. The subject is now living and was in London a few months ago.

"The subject of the present monstrosity is a healthy male child, named John Baptist Dos Santos, a native of Portugal, six months old, and whose singular conformation the Fellows have this evening had an opportunity of personally examining. The father and mother are both healthy, of short stature, and dark complexion; no peculiarity of any kind has been observed in any of their family. The mother has had two well formed children. She remarked nothing unusual during her pregnancy; the child was born at full time, and the labor was an easy one. As the child presented peculiarities which her medical attendant believed to be unique, the parents determined to come to London to exhibit the infant, and I was requested to see the child, which is characterized in a printed paper as 'The Human Tripod, or three-legged child, and first Bipenis ever seen or heard of.'

The child is exhibited lying on its back in a little cot; is lively and good-looking, and well proportioned, both in the upper and lower extremities, the peculiarities being confined to the parts below the umbilicus; a truss is worn on account of an umbilical rupture. Below the umbilicus, and to the right and left of the mesial line, are two distinct penes, each as large as the penis of a child of six months old; their direction is normal. I may mention that water passed from both organs at the same moment, during the time that Dr. Carsham and Mr. Perry were examining the infant with me. Each penis is provided with a scrotum, the outer half of each scrotum containing one testicle, the inner half of the scrotum is far removed from the outer, and the two inner halves appear like another scrotum between the two penes. Between and behind the legs of the child, we see another limb, or rather two lower extremities uniting together in their whole length. The upper part of this compound limb is connected to the rami of the pubis by a short narrow stem, half an inch in length, and as large as the little finger, apparently consisting of separate bones or cartilage, for, on moving the compound limb, at the same moment that the finger is kept on the stem, crepitation is felt, but I could not detect any pulsation. Immediately beyond this stem, and concealing it, the compound limb assumes a size as large as the combined natural thighs of the child, and within the upper part irregular portions of bone may be felt (probably a portion of a pelvis and the heads of the thigh bones), which may be traced down, united together into one mass, to a leg of comparatively small size, though still larger than either of the healthy legs, and terminated by a double foot in the position of talipes, with the sole turned forwards, and furnished with ten toes, the two great toes being in the center of the others: the two outer toes on each side are webbed. (See Figs. 39 and 40.)

When the child is placed on its belly, the spine and back present a perfectly normal appearance; the anus is in its usual situation; the functions of the bowels are duly performed. Viewed in this position, the compound limb assumes a roundness and fullness equal to the buttocks of a young child, and a slight depression is observed, as if for the anus. Tracing the limb downwards, we find only one patella, which is on the same aspect of the limb as the anus; the joint bends freely, and the compound extremity terminates as above described. This compound limb is quite motionless, the upper portion alone appears endowed with sensibility; its vitality seems low, as the toes have a bluish appearance; the upper portion, however, is of the same temperature as the body of the child."

Mr. Acton says, "I am unable to find any description or plate of two penes on one body, as in the case before the Society. The Fellows, I think,

will agree with me in believing that this instance of double penis does not depend upon a division of one organ; the distance at which they are placed one from the other, the existence of two canals, by which urine passed at the same moment, renders this little probable. I did not like to press the parents to allow me to pass catheters, on account of the tender age of the child, and I am, therefore, unable to say if two bladders exist, or if the two canals communicate." * * *

"The only other point to which I wish to call the attention of the Society, is the question of removal of this compound limb." * * * "In the present case, every circumstance is in favor of an operation. The health of the child proves the existence at least of one entire set of healthy organs, capable of performing all their functions; the medium of communication is narrow, and contains probably no important part; but what especially demands the attention of the parents, is the low vitality of the limb; with every precaution that can be taken, the toes have now a bluish appearance, and the history of partial double monstrosity shows, that any, however slight, scratch or contusion heals slowly, and generally ends, at first, in the death of the part, and subsequently of the child.

If the infant escapes this source of danger, its system is found incapable of supporting this additional limb, and the child perishes from debility. There can then, I think, be no doubt that an operation will be necessary, to give the child a chance of arriving at puberty; and in the absence of any one counter indication, I think all will agree, the sooner this is performed the better, for the security of the child."

The editor of the *Medico-Chirurgical Review*, (April, 1847, vol. 50, p. 322,) after quoting Mr. Acton's account from the *Transactions*, adds: "This child has since been exhibited in Paris, and we have noticed in the journals that more than one eminent French surgeon has expressed an opinion favorable to an operation."

I have been unable to find any further account of this "Tripod" child until July, 1865, when I received a *carte de visite* of an adult "human tripod and bipenis," from Mr. Jacob Mathews, clerk of the N. Y. City Hospital, who informed me that it was photographed by Fredericks. There was no history accompanying the picture, yet I at once recognized the resemblance between it and the child described and figured in the *Med-Chir. Trans.*; indeed, I was quite confident that it was the adult development of the child represented in Figs. 39 and 40, which are copied from Mr. Acton's plate. The photograph is very accurately lithographed in Fig. 42. I at once wrote Mr. Fredericks on the subject, and received the following reply:

NEW YORK, Aug. 7th, 1865.

Dear Sir—Your favor of the 4th inst., inquiring for particulars and facts in regard to the three-legged man, is duly at hand. They are as follows: My partner at Havana visited Europe last winter, and going to Seville in Spain, there procured the original of the picture which you have in your possession. He represents him as a Gipsy, about 22 years of age, and with extraordinary animal passions; the sight of a female is sufficient to excite his amorous propensities. He functionates with both of the penes, finishing with one, and then continues with the other. * * *

He is in good circumstances, and refused the sum of 200,000 francs, which was offered him for two years' exhibition of himself.

Should you think it necessary, I could get further particulars from the Mayor of Seville. Respectfully yours, &c.,

G. J. FISHER, M. D.

C. D. FREDRICKS.

The facts contained in this letter confirmed my previous convictions that this man, and the child described by Mr. Acton, were identical. The whole question was almost immediately after set at rest by an account of "A Remarkable Case of Double Monstrosity in an Adult," in *The Lancet*, (Lond. Ed., vol. II, p. 124, August, 1865*) and illustrated by four very rough wood cuts, two of which I have copied to exhibit the peculiarities of the compound foot and leg. (See Figs. 41 and 43)

To render the history of this very interesting case as complete as possible, I have quoted a considerable portion of the account from the *Lancet*.

"The following is an account of a very remarkable monstrosity in an adult who has lately arrived in this country (England). He presented himself at our office, and we have requested Mr. Ernest Hart, of St. Mary's Hospital, to carefully examine the parts. He reports as follows:

'Jean Baptista dos Santos, native of Faro in Portugal, is 19 years of age, about five feet seven inches in height, well nourished, and symmetrically formed, with the important exception of the singular monstrosity here to be described. He is bronzed in tint, of intelligent expression, and well featured. When dressed in ordinary costume, he has all the activity and general appearance of any other well grown lad, concealing with complete success the supernumerary appendages which he bears. When stripped, the remarkable abnormality depicted in the engraving is seen.

He possesses two complete and well formed penes, placed side by side, and a large central third leg and foot. It will be seen from the figure that each penis is in itself complete in its general anatomical characters. They are placed laterally, each about an inch from the median line of the pubes. They are of more than average dimensions, each measuring four and two-thirds inches while pendent. The prepuce is retracted. The left is four and one-fifth inches in circumference; the right somewhat smaller, three and two-thirds inches.

When the bladder acts, it expels its contents through both penes at the same moment. Under excitement, both become simultaneously erect; and other functions are performed by the two simultaneously. On the outer side of each is attached a fully-developed scrotum and testis. Between them hangs a shrunken scrotum, which contained two testes until he was ten years old, when, as he says, they ascended into the abdomen. He refuses to have bougies passed, so that it cannot be ascertained where the urethral passages communicate, and how they pass into the bladder, or whether this is normal in structure. He describes himself as possessing considerable virile power. It is difficult to say how the crura of the penes are attached internally, and on this subject it might be premature to hazard an opinion.

The third limb is of complex character, and presents some remarkable peculiarities. It exhibits marked evidences of the abortive effort at the production of twins, which is the key to the study of this singular monstrosity. At the first sight it seems to consist roughly of a large thigh, with an abortive leg, dislocated and bent up in front of it, and a misshapen foot, also dislocated. Thus, to begin with the foot, of which the dorsal aspect is above depicted, (see Fig. 41) it will be seen that it is really a coalescence of two feet, more or less perfect. The central toe is a consolidation of two great toes; on the right are the four toes of that foot, tolera-

bly perfect; on the left are four toes, irregular in development. the second dwarfed to a tubercle, the third clubbed and bifid, the fourth and fifth tolerably regular. The tarsus and metatarsus are fairly developed in double; and on each border may be seen the projecting parts of the fifth metatarsal bones. The projections at the junction of the foot with the leg, which might fairly be mistaken each for an astragalus, are, in fact, the double projecting ends of a bifid tibia. On examining the plantar aspect of the foot, (see Fig. 43) a double heel is very clearly made out. It is remarkable that the terminal part of this foot is devoid of ordinary sensation; but he does not complain of its ever feeling cold or causing him pain. The foot is dislocated. The breadth of the foot at its terminal extremity is seven inches; in the middle $6\frac{1}{2}$ inches; its length on the dorsum four inches; its length on the sole five inches.

The leg is, as already stated, dislocated and flexed anteriorly on the thigh; while its tibial extremities project over the dorsum of the foot. The fibula could not be made out. The tibia is *bifurcated* at its lower extremity, and terminates in two prominent masses with distinct though rounded malleoli. The skin is only partially sensitive. The only movement which can be given to other parts of the limb is that of partial extension, soon checked both by its displacement and by the fold of skin which connects it with the anterior aspect of what represents the thigh. The length of the leg is seven and one-half inches; around the lower expanded and bifurcated end it measures nine inches; at the part where the tibia bifurcates, five inches.

The thigh, or what represents it, is fleshy and somewhat pyramidal in shape; seen from the front, and in its usual position, it looks much like an ordinary thigh centrally situated between the two legs, and running upwards and backwards. It is freely movable. On being more nearly examined, it is seen to be attached by a sort of hinge-joint to a third bone. This articulates, by a joint having very free motion, to the arch of the pubes. Seen posteriorly, it is observed to terminate above and behind by a thick clubbed projecting extremity, of which the greater part is free and projects backward. The skin over the upper free part of the back of the bone is marked by a deep depression, or puckered cul-de-sac, upwards of an inch deep, of which the significance is open to various interpretations. The thigh measures nine inches round below, and seventeen inches above, at its thickest part. Here it is flattened from side to side; and there is a considerable mass of what is probably fat and muscular tissue. There is, however, no power of voluntary movement in this or in any other part of the limb.

The bone by which the direct attachment to the pelvis is effected is very short—about three inches in length. Its existence may easily be overlooked, for in front the skin passes continuously upwards from the thigh over it without any fold or marking. Its presence and mode of attachment are determined by grasping the limb firmly at its perineal attachment, and moving the thigh upon this upper piece. There is so much skin, fat and cellular tissue around this short bony piece, that it is difficult to determine its precise shape; but it will be seen to be irregularly curved and concave backwards. At its pubic attachment it moves freely; below, the limb moves on it by a hinge-joint. From the free movement at the pubic articulation, the limb can at will be twisted round and made to project posteriorly, so that it is not at all seen in front, and does not project there.

What is the pathological significance of this bone? During life it would be difficult to decide with certainty. Is it not probably a pelvic bone, misshapen and centrally attached—the osteal congener of the true pelvis? On examining the perineum posteriorly, it will be observed that there is a

tendency in the skin running down over the central limb to assume the characters of a double perineum. The true anal aperture is deviated by about half an inch from the median line; and the puckered cul-de-sac in the skin, over the clubbed and enlarged upper posterior extremity of the thigh, is suggestive of an abortive second anus. Then is this mass of bone only the upper end of a femur, with the trochanters excessively developed? or does it contain other abortive osteal elements?

These are suggestions which cannot probably be converted into certainties of one sort or the other, during the life of the young man. On the other hand, he remembers to have been told that when he was a year old the third limb projected more stiffly than it does now, and a Portuguese chemist, officiating as surgeon, broke the limb at some part, so as to make it less cumbersome. He believes that it was at the juncture of the lower leg to the thigh that this was effected, and that the leg was then bent upward and forward in the position in which it now is. Examination renders this probable, since it is certainly dislocated into an unnatural position, and has only a false joint. But it is possible that at this time the neck of the thigh-bone was broken away from the body, and that the upper bone is that neck, remaining attached to the arch of the pubes by a ball-and-socket joint, and making a false joint with the body of the bone.

* * * * * What is particularly remarkable, is the perfectly co-equal development of the two penes and testes, and their completely equal adaptation to the general functions of the individual organism of their bearer. It is true that the right penis is somewhat smaller in circumference than the left, but he states that they were originally of the same size. He habitually uses the left in sexual intercourse. No malformations had ever been observed in either branch of his family.

He has always been healthy. He is very active, runs very swiftly, and is a good horseman. He usually disposes of his third limb by strapping it with webbing in the right leg of his drawers to the side and front of the right thigh. As he walks, when dressed, no external deformity is observable."

The subsequent history of the case proves that Mr. Acton's fears of the failure of the circulation in the compound limb were not well founded.

The editor of the *Lancet* appears not to have been aware of Mr. Acton's paper in the *Med. Chir. Trans.*, as he does not allude to it in the article from which this last account was taken.

Förster* refers to the case, and places it under the head of *Dipygus dibrachius*. I have arranged it as the lowest species of the non-symmetrical forms of the Ischiopagus, to which genus it obviously belongs. The relation of the compound limb to the principal body, and of the whole to the genus Ischiopagus, will be readily understood by an inspection of figure 31. We will suppose A to represent the principal or well formed body; and the rudimentary head and body B, with its arms, to be removed, or to be absent by default of development; next, suppose the two supernumerary feet, legs and thighs, to be brought together on the median line and intimately fused by their inner aspects, great toe to great toe, etc.; now it only remains for us to bring down the lower extremities of the principal body in their normal positions, and we will have a case identical with that under consideration. The relative positions of this fused median limb, and the two sets of genitals, will be the same as in the Portuguese

* Op. cit. Text, p. 30. Pl. III. Figs. 1, 2.

Gipsey, with the patella, toes, &c., facing the corresponding parts of the complete body, and a set of genitals at either side of the compound limb.

Each lateral set of genitals is composed of halves furnished equally by the complete and incomplete individuals, as in the case of an *Ischiopagus* composed of two entire bodies. The law of symmetrical development, or of the equal balancing of homologous parts on both sides of a median line or axis of fusion, is here well illustrated by the bilateral symmetry of the genital organs.

CASE 42. *Ischiopagus dipygus*. FIG. 44.

[GURLT. *Handbuch der Pathology. Anatomie der Haus-Säugethiere* BERLIN, 1832. *Atlas, Tab. XIII, Fig. 2.*]

Figure 44 is copied from Gurlt's Atlas, as above cited; it represents a dog with a supernumerary posterior extremity, occupying the same relative position as the additional limb of the Gipsey just described, being in every respect its congener. The toes of the compound limb are placed in the opposite direction of those in the normal extremities.

If the dog were made to stand upright upon its hind feet, this extra limb would hang in the same manner as that of the Portuguese man. In Gurlt's classification this is denominated, *Emprosthomelophorus triscelus*.

LITERATURE OF ISCHIOPAGUS. J. Palfyn, *Licetus, De Monstris, Appendix par J. Palfyn, Leide, 1708. Tab. I, figs. 1, 2. Tab. II, figs. 1, 2. Tab. III, figs. 1, 2.* Geoff. St.-Hilaire, *Comptes Rendus de l'Académie Royale des Sciences, Tome IX, second semestre, 1839.* Duverney, *Hist. de l'Acad. des Sci., Ann., 1706, p. 418.* W. Montgomery, *Dublin Quart. Journ. of Med. Sci., vol. XV, 1853. Pl. 1, Fig. 2, p. 263.* A. Thompson, *Lond. & Edinburgh Monthly Journal of Med. Sci., vol. V, p. 639, 1844.* Alcock, *Dublin Med. & Physical Essays, vol. II, p. 33, (quoted by Montgomery) in Dub. Qr. Jr. of Med. Sci., vol. XV, p. 262, Pl. I, fig. 1, 1853.* Dubrneil, *Mém. du Mus. d'Hist. Nat. 1827. Tom. XV, Pl. 5, p. 245.* Knatz, *Ueber Doppelmissbildungen, Inaug. Diss. Marburg, 1856.* Maunoir, *Med. Chirurg. Trans. Lond., 1816, vol. VII, p. 257, Pl. III, Figs. 1-5.* Tiedemann, *Zeitschr. für Phys. Bd. III, s. 6, Taf. 3, 4.* Falck, —, F. X. Laso, *Exposición Histórica del Monstruo, etc. Cádiz, 1818.* Prochaska, *Abhandl. der Böhm. Gesellsch. der Wissensch. f. 1786, s. 218.* C. Lycosthenes, *Prodigiorum ac Ostentorum Chronicon, &c. Basileæ, 1557, p. 619.* A. Paré, *Les œuvres, Paris, 1575, fol. p. 809.* J. A. Pereira, *Edinburgh Med. & Surg. Journ. vol. LXI, p. 55, Pl. 1, Fig. 2, 1844.* G. Blasius, *Appendix to Licetus, 'De Monstris,' third edition, Amsterdam, 1665, p. 316, copper-plate.* Acton, *Med. Chir. Trans., Lond., 1846, vol. XXIX, p. 102, Pl. IV, Fig. 1, 2.* E. Hart, *Lancet, Lond., 1865, vol. II, p. 124, woodcuts. (Am. Ed., Jan., 1866, p. 71.)* Gurlt, *Handbuch der Path. Anat., &c., Berlin, 1832. Tab. XIII, Fig. 2.* Bruckmann, *Epistola itineraria prima, p. 7, Wolfenbutt., 1728, Pl. .* Hasenest, *Commerc. littér. de Nurimberg., 1743, semaine VIII, p. 58, Fig. .* Brisebarre & Duvolier, *Descript. d'un fœtus monstrueux, ibid., t. XVIII, p. 68; ann. 1763, Pl. .* Torlese, *Account of a monstrous birth, Philos. Transact., vol. LXXII, p. 44, Pl., 1782.* Valentin, *De Monstris Hassiacis, Ephem. nat. cur., dec. II, ann. 3, obs. XC, . 191, fig. 20.*

GENUS III.—DICEPHALUS.

Figs. 45-65.

Derivation.—From *δι δις*, 'double,' 'two,' and *κεφαλή*, 'head.'

Synonyms.—Doppelkopf. Dicephalium. Bicephalus. Bicephalium. Atlodyme, Atlodymus, Derodymus et Iodymus. *Is. G. St. H.* Hepatodym, Hepatodyme, Hepatodymus. *Serres*.

Definition and General Characters.—The genus *Dicephalus* is characterized by the existence of two distinct and separate heads, either equal or unequal, with various degrees of duplicity in the vertebral column. In the higher degrees, two distinct spinal columns are developed; in all cases they are placed side by side, either parallel, or converging from above downward. The component bodies are laterally conjoined, both of the faces look anteriorly and usually in the same direction.

The maximum degrees of *Dicephalus* approach the genus *Ischiopagus*, while the lower forms make an easy transition to the genus *Diprosopus*. It is readily distinguished from the former, by the vertebral columns never having a common axis; and from the latter, by always having two distinct and separate heads.

The number and condition of the extremities depend on the proximity and relative positions of the vertebral axes. If the spinal columns are in juxtaposition throughout their entire extent, two thoracic and two pelvic extremities only will be developed, one of each belonging to the right individual, and the same to the left. If the vertebral columns are parallel and more remote from each other, a median thoracic, and a median pelvic extremity will be developed, which will consist of two limbs, fused at the median axis of the compound body. (See Fig. 53.)

In proportion as the vertebral axes diverge at their cephalic poles, the duality of the intermediate parts of the bodies, their viscera and extremities, will become more complete.

As the divergence of the cerebral poles advances, we first observe a rudimentary fused pectoral extremity in the line of coalition, next a more complete compound limb, terminating in two hands, then two complete upper or anterior limbs, as in the case of *Ritta-Christina*, (Fig. 49,) and finally a compound median posterior pelvic extremity, which is more or less double. The internal structure corresponds with the external configuration, as a rule; the deviations in the viscera of two apparently identical cases are found to be very slight and unimportant.

The dicephalous monster, in common with other forms of double malformation, is composed of two more or less complete individuals, united on a median line, in relation to which the compound body commonly possesses bilateral symmetry; to this rule there are, however, numerous exceptions. In the typical examples of each species, the bilateral balancing of corresponding parts is complete, while, in a series of the non-symmetrical cases, almost every degree of unequal development of the component individuals is to be found. The deviations from the law of symmetrical development in double formations, are undoubtedly referable to the same disturbing influences which give rise to unequal development in the two

halves of a single body, or its extremities, as is often seen in the absence of parts, as of a limb, a kidney, etc.

Right and left symmetry in the viscera of all double monsters is a rule, which, at least in the genus *Dicephalus*, constitutes almost, if not positively, an invariable law. The hearts, livers, spleens, stomachs, &c., are as much right and left as are the hands or feet of a single individual. Right and left symmetry is occasionally observed in the external configuration of the bilateral halves of a dicephalous monster. In a recent communication from Prof. Wyman, of Cambridge, Mass., he informs me that he has lately dissected a double-headed calf, in which "each head was completely formed, but the two were as much right and left as a pair of hands or eyes." The facial axes were curved, but in opposite directions, from above downward and inward, and to such a degree that the two muzzles were nearly opposed to each other.

The viscera and other parts of double monsters may possess right and left symmetry, even in cases where the two component bodies are unequal in their development. The transposition of the heart and liver, of the left individual, and the stomach, spleen, &c., of the right, to produce right and left symmetry, is one of the most interesting facts connected with the structure of double malformations.

In all the varieties of *Dicephalus*, there is but one funis and umbilicus.

This genus includes the most common forms of double monsters which occur in man and the lower orders of animals. It is somewhat rare, however, in birds. Almost one-third of all the double malformations known belong to this genus. Of five hundred cases of human double monsters which have been examined, and are either contained in museums or have been described in various works, one hundred and forty were found to be *Dicephali*. Of these, thirty-four were males, and sixty females; the sex of the remaining forty-six was not ascertained.*

The *Dicephali* in many instances are susceptible of extra-uterine life, and in some cases have attained adult age.

Further details will be found in the synopsis of the several species, and in the history of the accompanying illustrative cases.

The several species into which the genus will be subdivided, are denominated by the number of extremities peculiar to each. As in other genera, the species will be graded on the descending scale, beginning with the highest degree of duplicity, and ending with the lowest. The species in this genus are not characterized by very marked and constant distinctive peculiarities; they shade into each other by such insensible degrees that it is difficult to draw satisfactory lines of distinction, or to adopt any but an almost artificial classification; the forms are so various, however, that even a provisional classification is quite indispensable in the description and study of them. The nomenclature which I have employed for the several species of *Dicephalus* is of a triplicate character.

Admitting the importance of avoiding complicated terms, I nevertheless deem it justifiable to employ such as convey the most obvious, accurate and comprehensive idea of the object under consideration.

* Förster, op. cit.

The several forms of *Dicephalus* are arranged in five specific groups, as follows, viz:

1. *Dicephalus tetrabrachius tripus*—two heads, four arms, three legs.
2. *Dicephalus tetrabrachius dipus*—two heads, four arms, two legs.
3. *Dicephalus tribrachius tripus*—two heads, three arms, three legs.
4. *Dicephalus tribrachius dipus*—two heads, three arms, two legs.
5. *Dicephalus dibrachius*— { var. a, *diauchenos*—two heads, two necks.
var. b, *monauchenos*—two heads, one neck.

SPECIES I.—*DICEPHALUS TETRABRACHIUS TRIPUS*.

Figs. 45-48.

Derivation.—From *τετρα*, 'four,' and *βραχιων*, 'the arm;' and *τρι*, 'three' and *πους*, 'foot.'

Synonyms.—Complex hepatodym, (Meigs after Serres) *Scelodidymus heptamelus*, (Gurlt, in Mammalia).

General Characters.—This species represents the highest degree of duplicity embraced in the genus *Dicephalus*. The component bodies are separate as low as the ensiform cartilage, below which point they are intimately fused. The vertebral columns are distinct, and converge, from above downward, in man; and, from before backward, in the lower animals. The bodies, in their coalition, occupy the relation of lateral juxtaposition. The cephalic and thoracic portions of each body are complete. The abdomen is common to both; its viscera is more or less compound; the liver is, as in all the *Dicephali*, a single mass, composed by the union of two, (*Hepatodyme*) the great lobes being external to the common median axis; either one or two gall bladders which are situated in or near the line of fusion. There are two distinct stomachs, and two intestinal canals, as low as the ilia, which are generally united beyond their middle, to form a single tube; the colon and rectum, which terminates in one anus, are single and common to both.

The pelvis consists of a normal right and left os innominatum, belonging to the corresponding individuals, to which are attached a pair of well formed extremities; the two sacra are separated by an osseous mass, consisting of rudimentary hip bones, which are more or less imperfectly developed. To this fused mass of iliac bones is attached a fused median posterior extremity, which, in a series of cases, varies from a mere stump-like projection, as in Fig. 48, to a limb consisting of two pelvic extremities, enveloped in a common integument and terminating in two well formed feet.

The highest development of the *Dicephalus*, as here given, makes an easy transition to the *Gastro-thoracopagus*, which will be described in the third class. The intermediate pelvic extremity almost invariably extends upward, along and between the two spines, and admits of very little passive, and no voluntary motion. The external genitals are always single, and occupy the normal position in relation to the two well formed limbs; the lateral halves are, of course, contributed by each individual. Single funis and umbilicus.

Förster noted thirty-one cases, in the human subject, belonging to this species, of which nineteen were females, and seven were males. In the remaining five, the sex was not ascertained.

In several instances, the four-armed-tripod dicephalus has been known to survive its birth several weeks, but none, to my knowledge, have reached adult age. Their usual non-viability is due to the frequent occurrence of atresia ani, or complexity of the abdominal or pelvic viscera, or to injury resulting from their difficult delivery.

CASE 43. *Dicephalus tetrabrachius tripus*. FIGS. 46, 47.

[WALTER. *Observationes Anatomicae, etc. Folio. Berolini, 1775. Tab. I--IV.*]

Anna Maria Woblack, aged thirty-five years, residing near Berlin, was delivered, Nov. 17th, 1773, of twins, one of which was a healthy, well formed male child, which survived; the other twin was a male dicephalus foetus, a brief history of which is here given:

The placenta was a single mass, to the opposite sides of which two cords were attached, one for the single, the other for the double foetus; the cord of the latter was three yards long. The normal and abnormal foetuses were both enveloped in a single and common chorion,

The component bodies of the double child were joined at the ziphoid cartilages, and below by the abdomens and pelvis; the space between the foetuses above the point of union forming a triangle. The anterior aspect of the upper portions of the bodies, as seen in Fig. 46, are somewhat inclined towards each other. The heads were very nearly equal; the neck of one was shorter than the other, and the upper extremities of the corresponding body were smaller. The umbilicus was in the centre of the common abdomen. The vertebral columns were complete in both, between the two sacra there was found a shovel-shaped osseous mass, consisting of rudimentary fused iliac bones, from the lower part of which hung a median lower extremity, which was attached by ligaments. This compound posterior pelvic extremity contained a femur; a tibia, which was thick and bent at an angle; the usual tarsal bones; seven metatarsals, six of which formed a row; the seventh and largest supported two toes, which were webbed.

The left heart was normal; the right was much smaller, and abnormal in development. There were two livers, united by their lateral and anterior margins, two gall bladders, two spleens, two pancreases, two stomachs, two intestinal canals, as low as the last portions of the ilia, where they unite to form a single tube—caecum, colon and rectum—which terminated in an imperforate anus. Two kidneys in the left side, and a very large one in the right; from these, ureters passed to a bladder common to both, behind which a rudimentary bladder was found, having no outlet.

The testes were still in the abdomen; their seminal ducts were found to enter the well formed bladder.

The distribution of the blood-vessels in the abdomen was very anomalous, the description of which will be omitted for want of space.

This is the second instance, in the human subject, where a single and a double foetus have been developed in the womb at the same time.

Prof. Panum,* in his researches on the incubation of eggs with two yolks, found an egg in which one of the yolks developed double embryos, while the other failed altogether to incubate; but for this failure, there would have been found in a single egg shell, (corresponding with the single chorion,) a single, and a double chick, analogous to the above case of Walter, and that of Blasius (see Case 38), in both of which the sex of the single and double foetuses was the same, in the former case male, and in the latter female.

* Untersuchungen über die Entstehung der Missbildungen; Zunächst in den Eiern der Vögel. Berlin, 1860. Taf. XII, fig. 1.

Fig. 46 represents the external configuration; at the lower part, below the well formed legs, will be seen the median extremity with double set of toes, &c.

Fig. 47 is a representation of the skeleton of this case, which requires no further description. The figures are reduced on stone, with great accuracy, from the large original copper plates of Walter.

CASE 44 *Dicephalus tetrabrachius tripus*.

[G. P. BOERSTLER. *Ohio Med. and Surg. Journ.*, Columbus, O., vol. 7, p. 267. March 1, 1855, with two wood-cuts; and remarks on Monsters by R. Gundry; also in *Am. Journ. of the Med. Sci.*, N. S., vol. xxx., p. 12, July, 1855, illustrated with two lithographic plates, and remarks by Prof. Chas. D. Meigs.]

The subject of this case, which strikingly resembles that of Walter, (Case No. 43) was born on the 16th of January, 1855, at Lancaster, Ohio, under the care of Dr. G. P. Boerstler, from whose history of it, communicated to the above cited journals, I have obtained the following account:

The mother was the wife of one of the most respected citizens of the place, and this was the product of her ninth labor, which, aside from its being a breech presentation, was neither unnatural nor difficult. There was one ordinary placenta, and one cord. The mother's recovery was rapid. The double child was born living, one individual being vigorous, the other feeble. Both took food, and both urinated and defecated. The sex was female. The children lived five weeks.

Description of the Children.—The heads, faces, arms and hands, and the chest down to the ensiform cartilages, are well developed, and in proper proportions. From the junction downward, one body, its anterior surface from side to side broader than in an ordinary child—the abdominal muscles well developed—the umbilicus in situ—two spinal columns perfect, the coccyx of each terminating on each side of the anus, and about half an inch from it—two pelves united, the left one belonging to the larger child, encroaching upon and lessening that of the right side. The sex female; one vulva and one anus, the opening of the latter not larger than an ordinary rye-straw; the two lower extremities are of proper size and well proportioned.

“Upon the back, and from the dorsum of the two ilia, arises a leg, running up between the two spines and the two inner shoulders, and terminating in a well-formed right and left foot, joined at the heel.

“This is, in truth, a double leg, enveloped in one common integument, having two femurs, two tibias, and two fibulas; the leg admits of partial motion directly backwards, to a distance of several inches from the back of the child.

“I have no doubt that nature designed one of these legs for each child; for, when the right child is awake, it moves its lower extremity, and also the left foot of the double leg; when asleep, the limb is quiet—and so with the other child. Tickling the sole of either foot, movement follows in the limb, but I have not perceived motion in the opposite leg to the one tickled.

“The two bodies have each its heart and lungs—puerile respiration distinct—the action of each heart easily felt, though the first and second sounds cannot be distinguished, owing to the rapid systolic and diastolic movements.

“So far as I have been able to detect, I believe the respiratory and cardiac action of both children to be synchronous, though the harmony of the former is interrupted by the crying of either child. I have frequently observed that when one of the children is nursing, and the other crying, the latter falls to sleep; so frequent is this occurrence that I hold it to be the

rule, and it shows the strong sympathetic relation between these *two distinct human beings joined in one*.

"What the union of organs may be in the abdominal cavity, we, of course, have no means of knowing; all reasoning thereon must be hypothetical. That the viscera are duplicated, we think probable. In the feeble child there existed the anomaly of the frænum linguæ arising from the dorsum of the tongue, about half an inch from the tip, and inserted into the palatine arch, of course rendering the tongue useless in sucking."

The following are some of the measurements: circumference of the larger head—occipito-frontal— $13\frac{1}{4}$ in.; in the smaller $12\frac{1}{2}$ in.; shoulders, 10 in., 9 in.; junction of bodies $16\frac{1}{4}$ in.; pelvic $13\frac{1}{2}$ in.; length from head to foot, $17\frac{1}{2}$ in.; 17 in.; weight, 10 pounds.

"*Death of the children.*—February 20th, the mother observed the larger gasp a few times, and at 15 minutes before 8 o'clock, breathing ceased; at 8.30 A. M. I saw it, and could not detect any respiratory act nor pulsation of heart or arteries. Drs. Effinger and Wagenhals pointed out to me the apparent movements of the carotids. We, however, all became satisfied that *these movements depended upon the circulation of the smaller child*. The asphyxiated condition continued *four and a half hours*—no respiration, no pulse; the capillaries of the *skin filled with dark blood*, giving a purple hue to its entire body, and beautifully showing the *demarkation between the asphyxiated and living child*; this line, from the junction down, extended half an inch to the right side of the umbilicus. A violent effort in coughing by the smaller child communicated a shock to the larger; convulsive movements of its limbs followed, and it uttered a few feeble cries, when it again relapsed into its condition of suspended animation, and so remained till five o'clock in the evening, when the smaller child died—one gasp in the larger, and in ten seconds it slept with its sister. Thus these children fortunately survived their unfortunate union only five weeks."

The above account of the mode of death in this double child is very interesting, and undoubtedly furnishes an explanation of the remarkable statements occasionally met with, in which one individual is said to have died many hours, or even days, before the other. In these cases the death was only apparent, being merely a state of asphyxia, or of suspended animation.

CASE 45. *Dicephalus tetrabrachius tripus*. FIG. 48.

[C. M. LAURIN. *Philosophical Transactions, London, 1723, vol. XXXII, No. 377, p. 346.**] "*An account of a monstrous birth in Lorraine.*"

In this case there were two complete vertebral columns and one pelvis. The median pelvic extremity was very rudimentary, consisting of a short single femur, a single tibia, terminated by one tarsal and two metatarsal bones. One rectum common to both. Sex female.

The double child lived two months, each individual nursed at the breast. The action of the hearts was not isochronous. See Fig. 48.

CASE 46. *Dicephalus tetrabrachius tripus*.

[SERRES. *Anatomie Transcendante, Atlas. Pl. XX.*]

The upper parts of the bodies and skeleton the same as in Walter's case. (Figs. 46, 47.) The posterior and median ischiatic and pubic bones are fused in one mass, to which is attached a femur, which is single above and bifurcated below. The right branch of the femur is well developed, with a leg attached, terminating in a foot with four toes. The left fork is imperfectly developed and has no leg or foot.

* This case is also reported in the *Hist. de l'Acad. des Sc.*, 1723, p. 27, par Cl. J. Geoffroy, also in the *Comm. Littér. de Nuremberg*, 1740, p. 270. In the *Mm. pour l'Hist. de l'Acad. des Sciences de Trévoux*, avril, 1724, p. 703. And thirty years later the case is republished in the *Journ. de Méd., chir., pharm.*, t. I, p. 464.

Each thorax contained a heart, and a complete set of lungs. The left heart had two superior venæ cavæ; the left one opened into the left auricle. The auricular septum was defective. The right heart had but one cavity, the auricular and ventricular septa being wholly wanting.

Alimentary canal double as low as the ilia, which were united and formed a sac connected with the navel. Livers fused, (Hepatodum) a Pancreas on each side. The kidneys each had a ureter, the exterior went to the anterior normal bladder; the interior ureter to the posterior, blind, sac-like bladder; the horse-shoe kidney on the left side had three ureters; one went to the normal, the other two passed to the closed bladder. Single male genitals.

CASE 47. *Dicephalus tetrabrachius tripus*.

[FÖRSTER. *Missbildungen des Menschen*, Jena, 1861. *Taf.* 1. *Fig.* 14.]

The subject of this case is preserved in the Pathological Museum of Würzburg [Prep. X, 1070.] Sex, female. One individual has a smaller head, neck, thorax and upper extremities, than the other. The lower parts of the body are equal in both. Two vertebral columns, between which are incomplete median hip bones; from this fused innominata a middle or third lower extremity passes off. The upper part of the thigh of this median limb is broad, the foot is bent laterally outward, at a right angle to the leg. At the tarsus is an isolated long great toe, the other toes are in double rows, four behind, two in front; the viscera of the chests normal; abdominal viscera mostly wanting; two large kidneys; bladder divided; two uteri, the anterior one complete and separate; the posterior one has a single os, but is divided by a partition within; it opens into a posterior vagina, which is externally closed. Vulva double; the posterior vulva has both large and small labia, with occluded vagina and urinary meatus; the anterior vulva is perfect. No anus or rectum.

CASE 48. *Dicephalus tetrabrachius tripus*.

[TELFAIR. *The Medical Repository*. N. S., vol. 2, (v. 17) N. Y., 1815, p. 306.]

"Mrs.—, of Greenville, Pitt Co., North Carolina, in October, 1813, was delivered of a female infant of the following description:—the length, from the apex of the head to the inferior lateral extremities, is one and a half feet; two heads, with their appropriate necks and shoulders, with four arms perfectly formed, constitute the superior part of the body, as far as the ensiform cartilage; here it becomes single and apparently natural, except that the anus is turned very much inward for the purpose of receiving a central thigh, &c., which seemed to have its attachment in the articulation of the os coccygis. This supernumerary member was pretty well formed, until it reached within an inch of the ankle, when it became abruptly bent interiorly, terminating in a club-foot, with six small toes in their usual positions, with a double one in the centre of the instep, rather towards their insertion. The child weighed fifteen pounds. The mother, who had previously given birth to eight well formed children, made a good recovery." (*Raleigh Star*, N. C., Oct. 22, 1813.)

From the description of the foot of this median limb, it must have resembled that of Dr. Wyman's case, Fig. 53.

CASE 49. *Dicephalus tetrabrachius tripus*. FIG. 45.

[GURLT. *Handbuch der Pathologie, Anatomie der Haus-Säugethiere*, Berlin, 1832. *Atlas*, Tab. XV, f. 5.]

This figure of a calf is copied from Gurlt's atlas, to illustrate the species in the mammalia. Gurlt denominates this form *Scelodidymus S. ptamelus*—the seven-limbed, leg-joined species.

LITERATURE.—J. G. Walter, *Observ. Anatom., etc.*, p. 1, Tab. I, 1775. G.

P. Boerstler and Gundry, *Ohio Med. & Surg. Journ.*, v. 7, p. 267, March 1, 1855. Also in *Americ. Journ. Med. Sci.*, N. S., v. XXX, p. 12, Pl. 1, 2, July 1, 1855. C. M. Laurin, *Philos. Trans.*, London, v. XXXII, p. 346, 1723. Serres, *Anat. Transcend.*, Atlas, Pl. XX, 1832. A. Förster, *Missbildungen des Menschen*, p. 24, Taf. 1, f. 14, 1861. Telfair, *Med. Repository*, N. Y., 1815, v. 17, p. 306. Gurlt, *Handbuch d. Pathologie, Anatom.*, 1832. Tab. XV, f. 5. Büttner, *Anat. Wahrnehm.*, p. 58. Otto, *Descr. Monst. sexc.*, N. 348, 1841. Asch, *Zeichnungen*, 1, 2. Staub, *Pr. Ver.-Zig*, 1856, 2. Tulpins, *Observat. Medic. Lib. III, cap. XXX*, v. III. Vide Licetus, *De Monstris*, 1665, p. 337.

SPECIES 2. *DICEPHALUS TETRABRACHIUS DIPUS*.

FIGS. 49-51.

Derivation.—From *δι*, 'two,' and *πους*, 'foot.'

Synonyms.—Psodyme, Psodymus, Xiphodyme, Xiphodymus, *Is Geoff. St. Hilaire*. Didymus symphyo-thoracogastricus, *Barkov*. Thoraco-Gastrodidymus, *Gurlt*. In quadrupeds, Gastrodidymus tetrachirus; Ischiodidymus hexamelus, *Gurlt*.

General Characters.—In this species the vertebral columns converge from above downward; in some cases they are united in the lumbar or sacral region, but usually the sacra are merely in contact. The close proximity of the sacra prevents the development of a median pelvic extremity, as in the last species; the bodies are, however, so far separated above, that two complete pairs of thoracic extremities are developed. The fusion of the component bodies usually extends from, and below, the xiphoid cartilages, including the abdomen and pelvis, to the perineum. When the union is at, or above, the xiphoid cartilages, it constitutes the genus *Xyphodyme* of I. G. St. Hilaire; when below these cartilages, it is the *Psodyme* of the same author. I cannot readily see the necessity for such a division. The thorax of each individual and its viscera are, in most instances, normal. In the abdomen, which is common to both, the livers, and small intestines are fused, the details of which will be mentioned in the history of the illustrative cases.

In some cases, the vertebral columns are so nearly approximated above, that the coalition of the trunks extends nearly to the axillæ; the thoracic cavities intercommunicate more or less, and in rare instances the median arms are enveloped by a common integument, from the shoulder to the elbow.

Förster noted ten cases in the human subject, four of which were males, and four females; the sex of two was not ascertained. It is a very rare form in the lower animals.

This species possesses a high degree of viability; in some instances the four-armed, two-legged dicephalus has, undoubtedly, attained adult age.

CASE 50. *Dicephalus tetrabrachius dipus*. FIGS. 49-51.

[SERRES. *Recherches d'Anatomie Transcendante et Pathologique*, etc. Paris, 1832. Atlas, Pl. I-IX. MICHAELIS, *Anali Universali di Medicina*, for May, 1829. Translated and reprinted in *The Am. Journ. of the Med. Sci. O. S.*, vol. 5, p. 272, also in the *N. Y. Med. & Phys. Journ.*, vol. IX, p. 422, and in various other works.]

Maria Teresa Parodi, aged about thirty-two, resident of Sassari, in Sar-

dinia, having previously given birth to eight well formed children, was delivered on the 3d of March, 1829, of a female infant, the upper part of which was double. It presented by the heads, which were delivered without much difficulty, one following the other.

The heads were separately baptized, the right christened Ritta, and the left Christina.

The umbilical cord and placenta were single.

The heads, arms, and upper portion of each thorax, to a point a little below the mammae, were separate and normal; below this point the bodies coalesced, forming an apparently single body, a single abdomen, two lower extremities, single genitals, etc.

The anterior surface of the thorax appeared to form only one common cavity, the middle of the sternum being somewhat concave, and forming, as it were, a furrow, at the sides of which the sternal extremities of the ribs of both the children met. Each individual had two mammae in the normal positions. The necks were quite isolated, and had two shoulders between them. The anterior surfaces of the children were directed towards each other in such a manner that they embraced each other with the inner arms. Fig. 49.

The abdomen was not much larger than that of an ordinary infant of the same age; the navel was in the usual place. The lower extremities and genitals were well developed. The anus single, and in the normal position.

Ritta-Christina was brought to Paris by the parents, who were poor, for the purpose of public exhibition, which, however, was not permitted by the police, and was only accomplished to a limited extent, and in the most clandestine manner. Dr. Montgomery remarks, "It is rather amusing to know that the public authorities interdicted their exhibition except under most stringent restrictions, for fear that it would open a door for psychological speculations and discussions.

The failure of the parents to secure the public patronage increased their poverty. The double child was kept in a cold room, and its death was undoubtedly hastened by the consequent unavoidable exposure:

Many interesting observations were made during the life of this compound child. The nervous systems seemed to have but little communication, except in those parts which were in the line of union, as the anus and sexual organs. If the right limb was pinched, or the sole of the foot tickled, Ritta only felt it; and if the left, only Christina; so that, of the common pair of limbs, the right evidently belonged exclusively to one individual, and the left to the other, (as was verified on dissection.) One would sleep while the other remained awake and in the act of nursing; or smiled while the other cried or was quite tranquil.

The children were suckled by the mother and a nurse; they experienced the sensation of hunger at different times, from which it appeared, even during life, that two stomachs existed (a fact subsequently ascertained.) They experienced a simultaneous inclination to expel the urine and feces.

The temperature of the skin of both was uniform. Ritta was, however, affected somewhat with cyanosis. The pulsations of the hearts were synchronous when both were in their usual health, so that an examination with the stethoscope indicated only a single heart. The ordinary pulse was about 90 per minute; towards the end of their fatal sickness, Ritta's pulse was 120; while that of Christina was 102.

There was a remarkable difference in the expression of their countenances, Christina's being gay and happy, while Ritta appeared sad and melancholy, which was the result of suffering.

At birth, and for two weeks later, the health of both children was apparently equally good; subsequent to this time, Ritta was observed to be

feeble, to have an icteric hue, and to be affected with slight ophthalmia, while Christina remained in vigorous health.

They died at Paris, Nov. 23d, 1829, having lived eight months and eleven days.

Ritta, whose constitution was delicate, and who had always been feeble and more or less ill, at last became very sick, three days previous to her death; during which time her indisposition did not in the slightest degree affect the health of Christina, who continued in perfect health, being joyous and gay. At the moment when Ritta died, Christina was hanging on the breast of her mother and playing with her face; suddenly she relaxed her hold, heaved a sigh, and expired.

The autopsy failed to furnish a satisfactory solution of the immediate cause of death. A slight adhesion of the posterior part of the pleura of the right side, with emphysema of the lungs, indicated the existence of inflammation, which had neither been intense, nor extensive, apparently not sufficient to prove fatal. A considerable accumulation of feculent matter was found in the rectum, which, with the pulmonary obstruction, though slight maladies in a well constituted and vigorous body like that of Christina, would prove serious to one so debilitated as that of her sister. Their hearts were both enveloped in a single pericardium; that of Ritta was compressed by that of Christina (Fig. 50,) and, being otherwise obstructed in its movements, found itself incapable of reacting against the congestion produced by the interruption of the great intestine.

"The remote causes of the disease," says Dr. De Michaelis, "by which death was produced, may doubtless be traced to the delicate constitution of Ritta, and to exposure to the first colds of winter, in apartments very imperfectly heated. It was with difficulty that Ritta supported the fatigue of traveling, while her sister seemed to suffer no sort of inconvenience. In the towns where they were well received, and where they could stay a long time, Ritta recovered her health with surprising rapidity, so rapidly that M. St. Hilaire says he has observed nothing equal to it in an isolated being, and ascribes it to the support received from her sister Christina, who, being endowed with a robust organization, had no doubt greatly contributed to these sudden restorations. Their stay at Lyons had been very favorable to their health. They seemed even well on their arrival in Paris, although Ritta appeared to be fatigued; but here, when the severity of the season required the greatest care, the relatives, deceived in their hopes by the interference of the authorities, were reduced to a mode of life inconsistent with the care which was necessary for the preservation of the child."

Ritta-Christina was evidently not destined to attain advanced age. There was too much inequality between the two parts, but everything indicated that they might have lived for several years.

The possibility of prolonged life in a dicephalous human being, is, in this instance, satisfactorily demonstrated. That cases have occurred, in which they have reached adult age, is rendered probable; at least, we have less reason to doubt the veracity of the old writers who assure us that such cases have existed.

The same authority which objected to their exhibition while living, wished to prevent their examination after death, and ordered their burial within twenty-four hours; and it was only at the urgent solicitation of Is. Geoff. St. Hilaire and others, that permission could be obtained for delay, in order to investigate their organization.

Autopsy—The right lobes of the lungs of Ritta, and the left of Christina, were not fully developed. The pericardium was single, but enclosed two

hearts, which were right and left, touching at their apices, Fig. 50. in accordance with the general law which holds in the development of double formations, viz: *situs inversus* of the non-symmetrical organs, as the heart, stomach, spleen, pancreas, liver, &c. The hearts were so situated relatively to each other, that during life their contraction and dilatation were synchronous, and hence the stethoscope transmitted but a single sound, which led to the opinion that only one heart existed. The connection and relative position of the hearts afford a rational explanation of the simultaneous death of both individuals; when life ceased in Ritta, Christina died in consequence of the interlocking, and hence immobility of her own heart. The cyanosis which was observed in Ritta was found to be in consequence of a triple perforation of the inter-auricular partition, and the existence of two superior venæ cavæ, one of which opened into the left auricle, and the other into the right auricle. There was but one inferior mesenteric artery, which was supplied from the aorta of Christina. There was an anastomosis of the inner or approximating iliac arteries belonging to each individual, forming a large transverse branch, which served to unite the circulation of the two children. It was undoubtedly through this channel that an admixture, or sort of transfusion of blood took place, which explains the rapid recovery of Ritta from her attacks of indisposition previously referred to.

The sympathetic nerves were separate and distinct as low as the pelvis.

The digestive organs were double and separate as far as the lower third of the ilium; from thence they became single and continued so to the anus. The cæcum lay to the left side. The stomachs, spleens, etc., were right and left, as is seen in Fig. 51, (from Serres, op. cit. Pl. VII.)

The livers, also right and left, were fused; there were two gall bladders, which occupied a median position. The union of the livers in duplex formations has been regarded as a class, by M. Serres, and termed *Hepatodym* monsters.

The uterus was double.

The vertebral columns were entire, and separated at the sacrum by a mass of bone, consisting of fused rudimentary *osæ innominata*. The sternums were united at their manubria; they were placed transversely between the two bodies, one being anterior and the other posterior.

CASE 51. *Dicephalus tetrabrachius dipus*.

Sir Astley Cooper saw a case in Paris in the year 1792, which was similar to that of Ritta-Christina; it is referred to in a book entitled *A Trip to Paris, by Twis*, 1793.

CASE 52. *Dicephalus tetrabrachius dipus*.

[RAMSBOTHAM *System of Obstetrics, Am. Ed*, Phila., 1856, Pl. 60, fig. 2, p. 624.]

This work contains a very good figure of a case precisely like that of Ritta-Christina; the fœtus is a male at full term, "the original of which is in the London Hospital Museum." Dr. Ramsbotham gives no further facts or history of the case.

CASE 53. *Dicephalus tetrabrachius dipus*.

[BLAND *Philosophical Transactions*, 1781, v. 71, Pl. 17, p. 362.]

The vertebral columns were united at the sacrum; single pelvis, two lower and four upper extremities; two thoracic cavities, each had a heart and lungs, the right more complete than the left; two stomachs; the upper half of the small intestines double, the lower single; one bladder. Sex male.

CASE 54. *Dicephalus tetrabrachius dipus*.

[REGNAULT. *Écarts de la Nature, Paris*, 1775. Pl. 27.]

In this case the two median arms are superficially united from the shoulder to a little beyond the elbow.

CASE 55. *Dicephalus tetrabrachius dipus*.

[VALENTIN. *Act. Acad. Nat. Cur. Tom. III. Obs. 124, p. 283.*]

This case was similar to the above of Regnault.

CASE 56. *Dicephalus tetrabrachius dipus*.

[BUCHANAN. *Rerum Scotticarum Historia. Aberdeen, 1762. Lib. XIII. Cap. VII, p. 362.*]

The following case is frequently referred to in works on Forensic Medicine, and in essays on teratology. I here furnish the reader with a literal translation of the entire chapter, from the edition of Buchanan's history above cited. It can scarcely be doubted that such a case existed, but the story of the death of one body "very many days before the other," is simply preposterous and incredible. The simultaneous death of the component bodies of a double being, even in cases much less intimately connected than in this instance, has been so many times observed, that it may now be regarded as a general fact, if not an invariable rule.

"About this time a new kind of monster was born in Scotland, in the lower part of the body, of the male species, and not differing from the usual form of men. The body above the navel was double in all its members, both in appearance and in reality. The king took diligent care of this being's education and training; and especially in music, in which he made wonderful progress. Besides, he also learned various languages; and the two bodies manifested discord between them from differing wills. Sometimes they would quarrel, and sometimes would please one another. Sometimes also they would consult together with each other. This also was remarkable concerning him, that when the loins or limbs were hurt, each body would feel the pain equally. When either was pricked or injured above, scarce any pain was conveyed to the other body. This distinction was much more evident in death; for when one body had been dead very many days before the other, the survivor was infected little by little by the putrescence of his other half. This monster lived twenty-eight years, and died while John the Regent was administering the affairs of Scotland.

We have written concerning this matter the more confidently, because there are very many honorable men living still, who saw him."

King James the Third, during whose reign this prodigy was born, died in battle on the first of June, 1488. This double man must have died within a few years subsequently, as John was the Regent of Scotland but a very short time.

In the historical introduction to this essay, under the head of the fabulous history, I have given another case similar to the above, in which it is stated, that "one dying, the other survived, and the living carried about the dead for the space of three years, till she died also, through the fatigue of the weight, and the stench of the dead carcase!"

It is possible, in some instances, for one of the individuals of a double being to become asphyxiated, or for life to be partially suspended, so far, indeed, as to simulate death, and to remain in this condition for a length of time, but at last, the two individuals usually expire at the same moment, with more or less convulsive movements in the apparently lifeless body, thus furnishing evidence of a condition of mere suspended animation.

CASES 57, 58. *Dicephalus tetrabrachius dipus*.

[GURLT. *Handbuch der Pathol. Anatom., etc.* Berlin, 1832. *Atlas. Tab. XV, figs. 1, 4.*]

The above figures referred to represent two double calves; each has four thoracic, and two pelvic extremities. The vertebral columns were entire and separate, each terminating in a well-formed tail. (Fig. 1, Pl. XV.)

Gurlt denominates this *Gastrodidymus tetrachirus*. Fig. 4 only differs in having the vertebral columns a little more widely separated, with a somewhat greater angle of divergence, and this he classifies under the name of *Ischiodidymus hexamelus*. It in no respect corresponds with the general characters which I assign to the genus *Ischiopagus*, while it agrees in every particular with the species under which I have here included it.

CASE 59. *Dicephalus tetrabrachius* [vel *tetrapinna*] Fig. 52.

[JACKSON. *Descript. Cat. of the Anat. Mus. of the Boston Soc. for Med. Imp.*, 1847, p. 309, *Pl. IX, fig. 2*.]

Preparation No. 849, of the Museum referred to, is "a double-headed fish preserved in spirits. The two heads are about equally developed, and the fusion commences just behind the pectoral fins, the spines being traced separately to behind the anus. Each individual has a dorsal fin, and two pectorals (which correspond with the arms), but the anus, and a single pair of ventral fins are common to both. The specimen belongs to the genus *Pimelodus*, and measures one inch and three-fourths in length, and one-third of an inch from the anterior extremity to the point of fusion. It was taken in the Gulf of Mexico, by Lieut. White of the U. S. Navy, he having caught it there in his hand in 1846." Vide Fig. 52.

LITERATURE.—Serres, *Rech. d'Anat. Trans. et Path.* Paris, 1832. *Atlas, Pl. I-IX*. Michaelis, *Anat. Univ. di Med.*, 1829. *Am. Jr. Med. Sci.*, O. S., v. 5, p. 272. *N. Y. Med. & Phys. Journ.*, v. IX, p. 422. Sir Astley Cooper, *A Trip to Paris, by Twiss*, 1793. Ramsbotham, *System of Obstetrics*. Am. ed., 1856, *Pl. 60, fig. 2*, p. 624. Bland, *Phil. Trans.* 1781, v. 71, *Pl. 17*, p. 362. Regnault, *Ecart de la Nat.* Paris, 1775. *Pl. 27*. Valentine, *Act. Acad. Nat. Cur.* 7, III. *Obs.* 124, p. 283. G. Buchanan, *Rev. Scot. Hist.*, 1762, *Lib. XIII, Cap. VII*, p. 362. Jackson, *Descr. Cat. Anat. Mus. Boston Soc. Med. Imp.*, 1847, p. 309, *Pl. IX, f. 23*. Büchner, *Act. Acad. Nat. Cur.*, v. II, p. 217, *Pl. V*. Licetus, *De Monstris*. Leide, 1708, p. 114 and p. 319. Riolan, *De Monstr. Nat. Lutet.*, Paris, 1605. Gurlt, *Handbuch d. Path. Anat.*, 1832. *Atlas, Tab. XV, f. 1, 4*.

SPECIES 3. *DICEPHALUS TRIBRACHIUS TRIPUS*.

FIGS. 53, 54.

Derivation.—From *τρι*, 'three,' and *βραχιων*, 'the arm;' *τρι*, 'three,' and *πους*, 'foot.'

General Characters.—The vertebral columns are parallel, or nearly so, and are complete and separate throughout their entire extent. They are necessarily not widely separated, otherwise the median thoracic and pelvic extremities would not be fused, which is the distinctive characteristic of this species. The compound median upper and lower limb are generally about equally developed, but a series of cases will exhibit a great diversity in the extent of the duplicity, which is found to vary from mere hump-like eminences, to limbs of the normal length, the latter terminating in well-formed hands and feet. The medium scapulas are in most instances con-

fluent, in the higher forms; the extremity arising therefrom is, externally, apparently single, but dissection shows that it contains the elements of two; the bones either fused or distinct. Those of the fore-arm are much more commonly distinct than those of the upper arm; the muscles, nerves and vessels are modified correspondingly.

The hearts are generally distinct, but are contained in a single pericardium; the livers are always fused; the stomachs and upper portion of the small intestine are separate. In short, the abdominal viscera does not materially differ from that of the species previously described. The double viscera are in all cases right and left. The history of a few cases will supersede the necessity of more minute detail in this place.

The present and the following species, in which there are three pectoral and two pelvic extremities, are embraced under one head by Förster, who has noted twenty-five cases, to which I will add three, two of which were recently published, the other heretofore unpublished, making twenty-eight. Of these nine were males, seven females, while in twelve cases the sex was undetermined in consequence of negligence in the reporters. Notwithstanding the close proximity of the hearts, and fusion of the viscera, this species possesses a considerable degree of viability. In some instances life has been continued for several weeks.

CASE 60. *Dicephalus tribrachius tripus*. Figs. 53, 54.

[J. WYMAN. *Boston Med. & Surg. Journ.*, v. 74, p. 169, wood cut. March 29th, 1866.]

"The fetus here described was presented to the Warren Museum, of the Harvard Medical School, by Dr Fenn, of Boston. It was nine inches in length, had two well-formed heads—the right of which will be called A and the left B—facing each other somewhat obliquely; the two necks met on a level with the shoulders. Seen in front, the trunk and limbs had the usual form, except that the thorax was broad, and the limbs of the two sides were connected with different vertebral columns. There was neither genital nor anal opening, but a small spherical body existed in the place of a penis. From this a double raphé, in the shape of a V, extended backwards, each branch directed towards the coccyx of the same side.

On the hinder face, a third symmetrical arm was attached, on a level with the normal ones. The hand was in the same plane with the other segments of the limb, viz.: from before backwards, the thumb pointing between the heads; it had no palm, but two backs, and each finger had nails on the two sides. The thumb and index finger were connate. (See Fig. 53.)

The spinal grooves converged downwards, between which a third leg, symmetrical in structure, but somewhat distorted by pressure, arose on a level with the two normal legs, and was bent upwards, so that the toes pointed towards the back. The foot was compound, and provided with two groups of toes, of three each, one right and the other left, and a single large symmetrical toe arose from the middle of the back of the foot. This toe had a nail on each side. (Fig. 54.) If this third leg is brought down to a level with the others, the heel is directed to the space between the other two feet, and thus the legs together form a true tripod.

Skeleton.—A general conception of the plan of the skeleton may be formed by supposing two skeletons placed side by side, the arms nearest each other pointing backwards and palm to palm, and the corresponding legs with the toes turned backwards, and then each skeleton cut in a plane extending from the median line in front, outwards to the right in one, and

to the left in the other, through the clavicle, glenoid cavity, lengthwise of the arm and hand, so as to separate the inner and palmar surfaces from the dorsal; also in the same direction through the ribs and acetabulum, lengthwise of the legs, and through the second toe; this done, the portions of the skeletons nearest each other are to be thrown away, and the remaining ones brought together and fused. This, except with reference to a few unimportant differences of detail, would give us a correct idea of the state of things in the skeleton here described.

On the hinder side of the double thorax there is no sternum, except a small portion, described below; the ribs are short, bent strongly downwards, reaching nearly to the pelvis, and are united by their cartilages.

The *arm* is connected with the rest of the skeleton by means of a piece of cartilage, which is attached to the top of the sternum above described, and resembles a manubrium, but has no connection with the ribs; it is directed backwards between the two necks, and supports a symmetrical *clavicle* which has the same direction. This has a deep fissure at either end, prolonged into a groove on the body of the bone. It is formed, as it were, of two clavicles, so turned that their upper surfaces are pressed against each other, and their greater concavities directed upwards. The *scapula* is composed of two bones, united at the glenoid cavity, having an acromion and spine on each side, but no coracoid processes. The bones of the arm, forearm and hand are perfectly symmetrical; all the bones of the last two are arranged in a plane passing through the fœtus from before backwards, the radius in front, and the ulna just behind it.

The *pelvis*, as seen behind, has neither pubic nor ischiatic bones, but consists of two ilia, the left one of A and the right of B, united at the acetabulum, which last is on the median line. The *femur* is much compressed laterally, is slightly twisted, but otherwise symmetrical. The *tibia* and *fibula* are in the same plane with the arms, and each has a projecting point of bone, as if they had both been fractured. The tibia is foremost of the two, and has a right and left tuberosity for the attachment of the right and left *patella*. The tarsal bones were not ossified, but the cartilage of a single os calcis was easily made out. The large and symmetrical toe had three phalanges, showing that it did not correspond with the great toe, contrary to what its great size would lead one to expect."

Space will not admit of adding the interesting details of the structure and arrangement of the muscles and nerves which Dr. Wyman has so fully described. I will therefore merely remark that their development corresponded with the osseous framework of the compound limbs, the parts on the two sides of the axis of coalition being balanced with marvelous symmetry.

"Two complete sets of lungs existed, and between them a single pericardium, enclosing two distinct *hearts*, symmetrically developed, one right and one left. A single lower *vena cava* entered the pericardium from below, and then entered each venous auricle by separate branches; the same was true of the upper *vena cava*. The venous auricles of the hearts were on adjoining sides, and the arterial auricles on the sides most distant from each other. The aorta of the heart of A descended on the right side of the vertebral column of A, and that of B on the left side of its vertebral column; in this case the right aorta, or that of A, was the one transposed, while that of B pursued the ordinary course. The innominate artery of A arose from the left side, and that of B from the right side of the arch. The recurrent branches of the *vagus* were in conformity with this arrangement." "A large opening was found in the diaphragm on the right side, and through this the right portion of the liver and some portions of the intestinal canal had passed.

The *umbilical cord* had one vein and two arteries as usual, the former entering the liver on the median line of the body.

The *liver* consisted of three portions, a right and left lobe, each of which corresponds with the right lobe of a normal liver, one of which is reversed. These unite on the middle line and form a third lobe, which corresponds with the left lobe of the normal livers fused. Each lateral lobe has a bile duct, gall bladder and common duct; also a portal vein, symmetrically arranged. A *vena cava inferior* passes up on each side in the notch formed by the union of the median and lateral lobes, but the two unite before entering the pericardium.

There were two *stomachs*, with their pyloric portions turned towards each other; the great cul de sac of that belonging to A was in the right hypochondrium, and therefore reversed, while that of B had the usual position and was in the left. A *spleen* was connected with each. The right and left duodenums came together a short distance from the pylorus and formed a lateral communication, but afterwards separated, and, though side by side, continued distinct nearly to the cœcum, which, as well as the large intestine, was simple. The length of the small intestine was thirty-two inches.

The urinary organs consisted of two compound kidneys and a urinary bladder with a double cavity. Each kidney had its hilus turned from the median line, was strongly bent on itself and had a *renal capsule* at each end, so that there were in all, four renal capsules. Each kidney also had two ureters, one of them much larger than the other, one set opening into the upper and the other into the lower cavity of the bladder. This, excepting the constriction near its fundus, had the usual shape; but inwardly the mucous membrane formed a partial partition between the upper and lower portions. The two sets of ureters opened, one just above and the other just below this partition.

There were two pairs of testes—one resting on the kidneys, or quite near them, and the other just at the entrance of the internal abdominal ring, on the front of the fetus. Each testis had an epididymus and vas deferens, but in neither case was it traced to its connection with the bladder. There were, however, to be seen just below the septum of the bladder, three openings, which probably belonged to the vasa deferentia, one pair entering the bladder separately, while the other united and entered through a single opening."

The above case, being a good type of the species, I have quoted freely from Dr. Wyman's excellent report of it.

CASE 61. *Dicephalus tribrachius tripus*.

[FÖRSTER. *Die Misbildungen des Menschen*. Jena, 1861. *Taf. VI, Fig. 5-7.*]

The skeleton is a preparation (No. 75) in the Würzburg Pathological Museum. The vertebral column completely double; a large well-formed anterior sternum, the posterior small and rudimentary. The median fused scapula spade-shaped, articulates with a single or compound upper extremity; a very delicate clavicle passes from the middle of the fused scapula to the anterior sternum. Posterior or median double ilia, with rudimentary ischiatic and pubic bones. A median compound pelvic extremity, consisting of a large, evidently fused, femur; two fused tibiæ and fibulæ; two patellæ; nine toes, the middle one composed by the coalescence of the two great toes.

CASE 62. *Dicephalus tribrachius tripus*.

[N. TULPIUS. *Observationes Medicæ*. Lib. 3, *Cap. XXXVII*, vide *Licetus op. cit.* Appendix to 3d Ed. Amsterdam, 1665, p. 336, with an admirable copper-plate.]

The child was delivered by the aid of a blunt hook.

The case resembles that of Wyman (Case 60,) except that the fusion of the median upper extremity only extended to the wrist, which terminated in two complete and separate hands, situated palm to palm. The median pelvic extremity terminated in two feet, which were, however, joined by their margins as far as the toes. The two individuals were symmetrical and well developed. Sex male.

CASE 63. *Dicephalus tribrachius tripus*.

[REGNOLI. *Sulla estrazione di un Feto Mostroso*. Pesaro, 1826. Pamphlet, pp. 23, with five outline wood-cuts.]

The mother was a peasant woman, resident of Pesaro, aged 27 years, this being the product of her second confinement, which occurred March 1st, 1826. The labor being difficult, required the aid of the blunt hook. The double foetus was born living, but soon died in consequence of the injuries received in its delivery. Sex female. The individuals were symmetrical; the vertebral columns were nearly in contact at the coccyges. The median arm had no elbow-joint, the fusion extended to the wrist, and terminated in two well formed separate hands with their palmar surfaces opposite, as in the above case of Tulpus. The median pelvic extremity turned upward between the backs; the knee and ankle joints were ankylosed; the foot had no heel; there were five compound toes, resulting from the fusion of the two feet by their plantar surfaces, the toes having nails on both sides, as did the fingers in Wyman's case.

CASE 64. *Dicephalus tribrachius tripus*.

[BENEDINA. *Gazzetta Medica di Milano*, Jan., 1844; also in *London and Edinburgh Journ. of Med Science*, 1844, and *The N. Y. Journ. of Med. & Collat. Sci.* vol. III, p 264, 1844.]

Foetus at full term, well and symmetrically developed. Faces directed forwards; the vertebral columns distinct and separated from each other one-fourth of an inch at their upper parts, and united near the top of the sacrum. Posteriorly, between the two necks, a third arm was articulated in a deformed scapula,—the humerus being larger than natural, and the fore-arm consisting of a double set of bones as far as the wrist, to which were attached two small hands; under this arm, and where the axillary cavity should have been, the traces of a second imperfect thorax could be seen. Posteriorly, and a little to the left, there were superadded to the natural pelvis another os ilium and a deformed portion of pelvis, whence arose an osseo-carnous process, two inches in circumference, oblong, with three articulations, and terminating at its lower extremity in something like a human foot, with three phalanges, or toes, furnished with nails. Sex male, penis well developed, two testicles in the scrotum,—a single orifice in the raphé precisely at the root of the penis, from which meconium issued,—being the only sign of an anus.

Two hearts were contained in one pericardium; the livers were united as in other cases of dicephalus. "The gall-bladder, stomach, pancreas, spleen, and intestines, were all single, and in their natural situation. In the pubic region were two urinary bladders, situated one anteriorly, and the other posteriorly—the first full of urine, the last empty, and both terminating in one neck of the bladder, and in one urethra." There were four kidneys, two in their normal situations, and two small ones in a posterior abdominal cavity, which was between and behind the vertebral columns; an imperfect thoracic cavity was found behind the spinal columns, containing a pair of rudimentary lungs, one of which belonged to the right, and the other to the left individual; this little thorax was separated from the corresponding posterior abdominal cavity by a small diaphragm. The viscera of the little abdomen was very rudimentary, the intestines

were small, and empty, except the ilium, in which meconium was found, and which terminated in the cœcum of the anterior cavity.

CASE 65. *Dicephalus tribrachius tripus*.

[DR. F. L. KEYES. *The Med. & Surgical Reporter*. Philadelphia, May 13th, 1865, vol. XII, p. 501.]

Dr. Keyes, of Jerseyville, Canada West, communicated the following case to the editor of the journal above referred to.

"I was called to a woman in labor in the fall of 1831, in her first confinement, Dr. T—— R——, in consultation; it was an inter-twin case. The children had two heads, and shoulders distinct, uniting at the opposing shoulders. The arms between the two projected backward, growing into each other, being visible at the elbow. The elbow was stiff. The fingers were also straight and stiff from some cause, *with nails on the inside and outside of each finger*. The bodies gradually coalesced, until at the pelvis they were united in a single pelvis, with two legs. There was also, however, a leg about two inches long, with a foot in proportion, projecting from the superior part of the sacrum. Each foetus had an arm, one on the right and the other on the left, of the natural size and form."

The sex is not given. The immobility of the fingers was due to the union of two hands, and their digits, by their palmar surfaces, which also explains the presence of nails on each side of the fingers. The stiffness of the elbow was due to the same cause.

LITERATURE.—J. Wyman, *Boston Med. & Surg. Jr.*, v. 74, p. 169, 1866. With a figure. Förster, *Missbildungen des Menschen*. Taf. VI, fig. 5-7, 1861. N. Tulpius, *Obs. Med. Lib. III, Cap. XXXVII*; also in Licetus, *De Monstris*. Appendix to 3d Edition, 1665, p. 336. Plate. Regnoli, *Feto Mostruoso*, Pesaro, 1826, figure. Benedini, *Gazzetta Medica di Milano*, 1844. See also *Lond. & Edin. Jr. of Med. Sci.*, 1844, and *N. Y. Journ. of Med. & Collat. Sci.*, vol. III, p. 264, 1844. F. L. Keyes, *Med. & Surg. Reporter*, vol. XII, p. 501. *Phila.*, 1865.

SPECIES 4. DICEPHALUS TRIBRACHIUS DIPUS.

FIGS. 55-58.

Derivation.—From δι, 'two,' and πους, 'foot.'

Synonyms.—Dérodyme, Derodymus. *F. Lauth* and *Is. G. St. Hil.* Omodyme, Omodymus. *Lauth*. Tetrachirus choristocephalus. *Gurlt*. (In animals.)

Distinctive Characters.—This species differs from the preceding one in having no third or median pelvic extremity; the pelvic viscera are more nearly single; the abdominal and thoracic viscera are, however, developed much the same as in the previous species. The median pectoral extremity varies from a compound limb, containing the elements of two enveloped in a common integument, with separate hands, and in some cases distinct fore-arms, through a series of degrees to little more than a mere hump-like projection containing the fused rudiments of two limbs. This species is defined from motives of convenience, rather than from the existence of any real specific distinctions.

As previously remarked, the several species of the genus *Dicephalus* pass into each other by a series of intermediate or transitional cases, which renders the classification, though practically useful, and almost indispensable, very artificial and arbitrary.

CASE 66. *Dicephalus tribrachius dipus*. FIGS. 56-58.

[BARKOW. *Monstra Anatomium Duplicia per Anatomen Indigata*, Tom. 1, p. 17, Tab. III, Fig. 1-4, 1832.]

Female.—Vertebral columns entire and separate. One sternum, posterior ribs fused making a ridge in the back part of the thorax. A middle or third upper extremity; two scapulæ; single broad humerus, with double condyles; two radial bones; one ulna; double carpus, and two hands, with the little fingers in the middle, and thumbs outward. (See Fig. 57.)

Fig. 58 represents the bones of the intermediate upper extremity, except the phalanges of the fingers; a, the rudimentary sternum; b, b, the intermediate clavicles; c, c, scapulas; e, junction of the articular margins of the scapulas; f, f, long heads of the biceps muscles; g, foramen through which the median nerve passed between the heads of the fused humeri; h, shaft of the fused humerus; i, fused ulna; j, right radius; k, left radius.

Fig. 56 shows the muscles, vessels and nerves of the anterior surface of the median upper extremity; a, a, clavicles; b, b, pectoralis major; c, c, deltoids; d, d, biceps muscles; e, e, long supinators; f, superficial flexor of the right hand; g, do. of the left hand; h, h, h, h, superficial veins; i, anastomosing branch with the cephalic vein; k, k, right radial artery; r, left radial artery; o, left median nerve; p, right median nerve; q, left radial nerve; i, right radial nerve.

Two clavicles, joined to an anterior sternum. Pelvis single; two sacra, separated by a rudimentary mass of bone. Two food pipes, two stomachs, small intestine double to within five inches of the lower end of the ilium, but lying in contact and enclosed in a common peritoneal investment; below this point the intestinal canal became single and remained so to the anus. The liver, though a single mass, was composed of two; one gall-bladder; one spleen, and one pancreas, both on the left side; four suprarenal capsules; three kidneys; two exterior, normal, with ureters; the middle kidney, small and roundish, lying behind and to the right of the uterus, had one ureter. On the left a corresponding ureter was found, but no kidney. Two urinary bladders, the anterior normal, the posterior small, with the natural openings closed. Two uteri, each with Fallopian tubes and ovaries. The anterior uterus large and normal, the posterior one small and without round ligaments; in this the os uteri is closed. Between the two uteri there is a single rectum.

The respiratory organs were double. Two separate hearts were contained in one pericardium; two aortas, which had no large communicating branch.

Fig. 57 represents the back view; at a, there is a deep fossa, with an infolding of the skin; b and c two smaller fossæ.

CASE 67. *Dicephalus tribrachius dipus*.

The following brief history of this case was communicated to me by my friend, Prof. N. Nivison, of the Medical College of Geneva, N. Y., to the Anatomical Museum of which it belongs. Prof. N. writes, "No one here knows anything of its history; except that several years ago it was brought to the college for sale. It has been sadly neglected—the alcohol has evaporated, it is partially decomposed, and even some parts are wanting. Its partial disintegration, however, affords facilities for studying its anatomy. There are two complete heads and necks, two spinal columns, converging from above downward, so that there is a double sacrum, but apparently only one coccyx. The ribs between the spines are about half an inch long. There are two lower and three upper extremities. The median scapulæ are joined by their proper external margins, (internal in relation to the line of fusion,) and form a sort of double glenoid cavity, which receives the head of a rudimentary humerus, which is double throughout its entire length, the two halves being so applied to each other that they pre-

sent the appearance of a single bone, which however could be easily separated. The bones of the fore-arm and hands are lost. There is but one sternum, one pair of clavicles, etc.; in short, the body is apparently single. Sex male."

The letter was accompanied with a rude sketch, by Prof. Stone of the same Faculty, from which it appears to resemble that of Barkow's case, Fig. 57.

CASE 68. *Dicephalus tribrachius dipus*.

[G. ARNISON. *The Lancet*, London, 1840, Vol. II, p. 606.]

Male, at full term, born at Stanhope, Durham, England, May 22d, 1840. The occipito-frontal circumference of each head, singly, measured thirteen inches, the two together nineteen inches. The fœtus was expelled by the aid of ergot, without instruments or mutilation, breech presentation, dead at birth.

Two well formed symmetrical heads, the vertebral columns about three inches apart, the median ribs united behind, so as to form a somewhat prominent osseous ridge between the spines. Two ani, situated about an inch apart, one on each side of the ordinary situation, or more correctly speaking, each anus was immediately beneath the coccyx of each vertebral column; between, and above these, was found a rudimentary structure nearly an inch long, and of the thickness of a goose quill, which was doubtless the rudiments of a median lower extremity. Such appendages have been described by some authors as tails, and are most apt to be regarded as such by persons unacquainted with anatomy. The two ani communicated with each other, opening into a rectum common to both.

"The anterior aspect of the child, as high as the sterno-clavicular region, presented no deviation from what is natural, the thorax, shoulders, arms, abdomen, genitals, (which were those of a male,) and lower extremities, being perfectly normal; but, to the upper part of the sternum there was articulated a third clavicle, which stretched across, from before backwards, midway between the two necks, which here issued from the trunk. The other extremity of this additional and nearly straight clavicle was attached to a sort of double-shaped scapula, situated on the upper and central part of the thorax, posteriorly, surmounting the ridge formed by the junction of the distal extremities of the imperfect median ribs. To this scapula was articulated a third, or rudimentary arm, the fore-arm of which contained but one bone, and was permanently flexed upon the arm by the adhesion of the adjacent ligaments, and terminated in a solitary well formed finger, lying near the shoulder, whilst the elbow arose perpendicularly to a level with the vertices; the triangular space between the heads posteriorly being thus occupied by this unique extremity."

As is too often the case, no dissection was made.

CASE 69. *Dicephalus tribrachius dipus*.

[ZIMMER. *Phys. Unters. über Missgeburten*. Taf. V.]

The left fœtus is smaller, has hemicrania, and complete spina bifida. The right fœtus is normal. Two vertebral columns. The ribs of the right side of one, and of the left side of the other fœtus are united to an anterior sternum which is common to both; the posterior ribs are fused. Two middle scapulæ, from whose articular surfaces arises a single humerus with a very broad head; the fore-arm has three bones—two radii, and a single large ulna, formed by the fusion of two. The limb terminates in two hands, united at the little fingers, the thumbs are directed outward. The median arm bears a striking resemblance to that shown in Fig. 57 from Barkow.

CASE 70. *Dicephalus tribrachius*. FIG. 55.

[GURLT. *Op cit. Atlas*, Tab. XIV, Fig. 5.]

This figure is of a calf with two heads, two pelvic and three pectoral

extremities. The median limb is distinctly double beyond its middle. Two vertebral columns, terminated by two tails. It belongs to the species *Tetrachius chorocephalus* of Gurlt.

Literature.—J. Barkow, *Monstra Anomal. Dupl. per Anatom. Indig.*, T. I. p. 17, Tab. III, i. j. 1-4, Berlin, 1832. G. Arnison, *The Lancet*, London, 1840, vol. II, p. 606. J. C. Zimmer, *Ueber Missgeburten*, Taf. V. 1806. Gurlt, *Handbuch der Path. Anat. Atlas*, Tab. XIV. Fig. 5, 1832. Rayger, *Ephem. nat. cur.*, déc. I, ann. 1, obs. 7, 1670. Fribe, *ibid.*, déc. I, ann. 3, obs. 165, p. 254. Valentin, *Act. acad. nat. cur. T. II*, obs. 124, p. 283. Tiedemann, *Ztschr. f. Phys. III*. Taf. 5-7. Meckel, *Monstr. dupl.* p. 76. Taf. 1-8. Is. Geoff. St. Hilaire, *Traité de Tératologie*, T. III, p. 175, 1836.

SPECIES 5. DICEPHALUS DIBRACHIUS DIPUS.

FIGS. 60-65.

Synonyms.—Dicephalus, Bicephalus, Dérodyme, Atlodyme.

General Characters.—This species includes the double monsters which have two distinct and separate heads, with either one or two necks, an apparently single body, an expanded chest, two thoracic and two pelvic extremities, one set of genitals, and one umbilicus.

It may be subdivided into two varieties, according as one or two necks are developed; in the former case they are denominated, *Dicephalus monauchenos*, in the latter *D. diauchenos*.

Sub-species 1.—Dicephalus diauchenos.

Each head rests upon its own separate neck. The duplicity of the vertebral columns, generally, extends throughout the entire length; in some instances the columns are separated by a space of several inches, while in others they lie in contact and terminate in two sacrums, and two coccyges;* in still other cases the vertebral columns are fused to a greater or less extent. The fusion is sometimes only found at the sacrum, while in a few rare cases it has been observed to extend as high as the middle or upper third of the dorsal range. (See Fig. 65.)

The structure of the other parts of the body depends upon the relative positions and proximity of the vertebral axes. If they are somewhat separated and divergent above, there will be a double series of short median and posterior ribs, which are either united into single arches, or in rare cases connected with a more or less rudimentary posterior sternum. It must be borne in mind, that however nearly the body of the dicephalus monster may approach singleness, its bilateral halves belong respectively to the corresponding head, that they are not monsters by excess, but rather by defect. In nearly all cases of symmetrical duplex formations, each individual is defective in consequence of more or less of its members or parts remaining undeveloped in the line of coalition; of course the absence or loss of parts is in proportion to the extent and intimacy of the fusion, being greatest in those apparently more nearly single.

In most cases there are two distinct hearts contained in a single pericardium. The hearts, like the stomachs and other organs, are manifestly

* In the lower animals, in all cases where the sacrums are distinct, two tails are developed; and in fishes two caudal fins.

right and left, their apices are directed to the median line of fusion, as are also the pyloric extremities of the stomachs. Right and left symmetry is sometimes observed in the external configuration, an example of which was seen by Prof. Wyman, of Cambridge, Mass., in a dicephalous calf; the facial axes were both curved downward and inward, towards each other, so far as to bring the muzzles opposite and nearly in contact.

In other cases the hearts are fused, the numerous cavities of the compound organ intercommunicate, and the arterial and venous trunks are multiplied. (See Fig. 59.)

When two spleens are found, one occupies the left and the other the right hypochondriac region. If one spleen only is developed, it is that on the left side; the right or transposed one is wanting.

This species of *Dicephalus* is comparatively common. Sixty-six human cases were noted by Förster, to which I can add several more, which I have seen in the Anatomical and Pathological Museums of this country, which cases have never been reported.

Several cases of adult *Dicephalus*, in the human subject, are referred to by authors. Förster mentions the case of a Turkish archer, of which he says there was an account published in a German newspaper, accompanied with an engraving. He does not give the title or date of the paper.

CASE 71. *Dicephalus dibrachius dipus*.

[GRUBER *Anatomie eines Monstrum Bicorporeum*. Prague, 1844.]

Two symmetrical heads, two complete and separate vertebral columns, single pelvis, small rudimentary hip bone between the sacrum; an anterior sternum well formed, posterior ribs united into single arches, a cartilaginous rudimentary scapula. Two food passages; two stomachs, with the fundus of each turned outward. From the lower end of the duodenum to a point five inches above the lower end of the ilium the two intestines are in contact, but are invested by a common peritoneal covering, which does not pass between, but merely over them; below this point the gut becomes single, large compound liver, two gall-bladders, and two bile ducts; no pancreas; one spleen, which was on the left stomach; omentum double.

The diaphragm single, by fusion, with five foramina, viz: one for the vena cava ascendens, two for the œsophagi, two for the aortas.

Two hearts in one pericardium. The right heart small, with two auricles; the right auricle receives the pulmonary veins, the left forms the right division for the entrance of the venæ cavæ; ventricles intercommunicate. The left heart large and perfect; auricles and ventricles separated by normal partitions, valves, &c. The vena cava communis inferior is formed by the junction of the two inferior venæ cavæ only half an inch below the liver. The arteries are connected by a transverse branch passing over the sacra.

Two sets of lungs and air passages; two thoracic ducts.

Urinary and genital organs single and normal.

The vagus and the sympathetic nerves were each double and nowhere connected. The inner spinal nerves, small and connected on the median line of fusion.

CASE 72. *Dicephalus dibrachius dipus*. FIG. 62.

[*Cat. of the Anat. Mus. of the Boston Soc. for Med. Improvement*, 1847, p. 309. *Prep. No. 850. Pl. X, fig. 25.*]

"A drawing of the alimentary canal of a monstrosity that was born in the practice of Dr. N. Ruggles, of Nantucket, in June, 1846, and was subsequently examined in this city. The following account of the case, as

it was reported to the Society, is here given, by permission of Dr. R. The subject of this case had two heads and necks, which were distinct throughout, one pair of upper and lower extremities, and a trunk which was formed by the fusion of two. Sex male. Mother was a middle aged woman, and this, which was her first labor occurred about the end of the eighth month. One of the heads presented, but Dr. R. brought down the feet, and after three hours accomplished the delivery, much force being required; the children lived about twenty-five minutes. Weight, five and a half pounds.

A hasty examination of the organs was made at the time by Dr. C. T. Collins, of New York, and Dr. R., and a short account of the case was published by Dr. C. in the *N. Y. Med. and Surgical Reporter*, of which he was at that time the editor. The body was then sewed up, but the organs, which had been removed in a mass, were preserved separately, and a few weeks afterwards the specimen was sent to this city, where it remained for a short time; here it was again examined, and very recently the whole has been returned to Nantucket and buried.

With regard to the external appearances, it may be stated that there was no trace of a third upper extremity, and that the two spines, being traceable to the middle of the back, would probably have met about at the sacrum.

On examination of the organs, there were found two hearts with a common pericardium. One was perfectly normal. The other was somewhat smaller; consisted of a single, large, ventricular cavity, from which there arose an aorta of full size, and a small pulmonary artery, the ductus arteriosus being very slender; the left auricle was very much larger than the right, the limits between them being well defined, though there was only the trace of a septum. The lower vena cava was common to the two organs, and divided just above the diaphragm.

Each aorta gave off a large vessel, which immediately divided, and just beyond this a second (undoubtedly the two carotids and a subclavian), the subclavian arteries arising from different aortas, as each of the two upper extremities belonged to a different subject. The aorta of the largest heart passed, as usual, over the corresponding left primary bronchus, but the other passed over the right primary bronchus of the second set of lungs, and somewhere between the arch and the diaphragm the two formed a common trunk.

The respiratory organs and thymus gland were in double sets, the lungs being small, irregular and much fissured, except the one which corresponded to the malformed heart, and was upon the right side.

The alimentary canal, having been washed out and inflated, a drawing was made of it by Dr. Jeffries Wyman (see Fig. 62). The two stomachs were well formed, and one of them was of full size; the other was about half as large as the first, and buried, as it were, in a cavity in the liver. The duodenum of each was about three-fourths of an inch in length; the two then united to form a single intestine, which was three inches and a half in length, half an inch or more in diameter, and much contorted. Near the termination of this irregular portion of intestine was a diverticulum, three-fourths of an inch in length, and adherent to the intestine, its cul-de-sac being directed towards the great dilatation into which the intestine now opened. The dilatation was three inches and a half in length in a straight line, and one and a half inches in diameter; considerably curved upon itself, and upon its large curvature sacculated, as the large intestine of an adult often is. The dilatation was followed by ten inches of small intestine, which arose quite abruptly, and eight and a half inches of large intestine, besides what may have been left in the body. The liver was single; lobes irregular. One well developed gall-bladder, with its ducts,

corresponded to the largest stomach, and near it there was seen the situation for the second, if it had existed. According to the statement of Dr. R. there was one spleen and two kidneys. In the mass examined here, there were found two rudimentary spleens connected with the large stomach, and about a line or more in diameter; one kidney with its renal capsule, and a second renal capsule without its kidney."

CASE 73. *Dicephalus dibrachius dipus*. FIG. 60.

[G. PFEIFFER. *American Journal of the Medical Sciences, N. S., vol. XII, p. 80, 1846.*]

Mrs. L—, aged forty-three, who had previously given birth to ten well-formed children, all living (four sons and six daughters), was delivered, August 21st, 1844, of a dicephalus foetus, which was dead at birth, in consequence of the difficulties connected with the process of parturition, which are given in detail in the report of Dr. Pfeiffer, of New Oxford, Adams county, Penn., in the Journal above cited. The report is accompanied with a wood cut, which I have copied (see Fig. 60). The figure is also used by Prof. Meigs, in his work on Obstetrics.

The foetus had reached the full period of uterine development, and was symmetrically formed, weighed over nine pounds; sex male, heads equal. No dissection was made; from external examination the spinal columns were believed to be fused below the first lumbar vertebra, which was broader than usual and felt rather concave in the middle; the second was apparently single, and normal. An inspection of Fig. 60 will serve the purpose of a further description. Prof. Meigs has prefixed to the report several pages of general remarks and theoretical considerations.

The case possesses no special interest, and is only introduced in this place on account of the figure which represents the typical form of the species.

CASE 74. *Dicephalus dibrachius dipus*. FIG. 61.

[W. E. HORNER. *Amer. Jour. Med. Sci., O. S., vol. VIII, p. 349. Vol. III. 1831.*]

This case is well reported. The account being brief, and illustrating most of the peculiar features of this form of double malformation, I have quoted it entire:

"An eminent practitioner in an adjoining State was called within a few months to assist Mrs. —, in labor with her third child. At four o'clock, P. M., before his arrival, the membranes had ruptured. He found a head presentation, with the ordinary phenomena of labor, and the pains severe and frequent. At seven o'clock the head protruded, and at nine in the evening the child was born dead. This infant having been brought to me for examination, the following is the result of the dissection.

External configuration.—The infant of ordinary size, had two heads and two necks, one trunk, two upper and two lower extremities. The transverse diameter of the trunk was greater than usual.

Skeleton.—Two distinct lines of spinous processes of the vertebræ could be traced under the skin from the heads down to the pelvis, which, upon further examination, on the removal of the soft parts, were found to arise from two spines, perfectly distinct from one another, excepting the lumbar vertebræ, which adhered laterally by their transverse processes, and the ossa sacra, which were fused like two sacra fixed edge to edge. The lower end of this double sacrum was bifid, and each fork had its own os coccygis. Each spine had its own distinct spinal marrow.

There was but one sternum, which was broader than usual, and exhibited by the double points of ossification, a disposition to form a double bone.

Allowance made for this state of the sternum and of the spines, there existed a total deficiency of the left side of the right skeleton and of the

right side of the left skeleton, excepting the beginnings of the ribs on these defective sides. These ribs were distinct in both fœtuses, being joined by ligament to their congeners, so that the skeletons were united also by that arrangement, as well as by the adhesion of the lumbar vertebrae and of the sacra. The general mechanism of these fœtuses resembled what would arise from cutting away the left side of one skeleton from the left shoulder to the sacrum and by cutting away the right side of another skeleton in the same relative line, and then uniting the two skeletons by the symphysis pubis—by fusion of the sterna at their contiguous edges—by fusion of the contiguous edges of the two sacra, and a ligamentous adhesion of the contiguous stumps of ribs.

Internal organization.—The anatomy of the necks was very anomalous, adhering as they did laterally at their roots; we found the right sterno-hyoid muscle of the left fœtus, and the left sterno-hyoid muscle of the right fœtus, united together at their inferior ends, and forming a transverse muscle, (with a slight convexity downward,) running from one os hyoides to the other. The heart was placed in the neck, fairly above the sternum, and resting upon the upper end of the latter.

The heart, though but one body, evidently arose from the coalition of two hearts, one for each fœtus. For instance, on its right side was a right auricle belonging to the right fœtus, and to the left of this was a ventricle, from whose summit proceeded an aorta and a pulmonary artery for the right fœtus.

On the posterior side of the heart existed a middle auricle—the left internal jugular vein of the right subject, and the right internal jugular vein of the left subject, united into a common trunk, which discharged into this middle auricle. The latter was found to communicate with the right auricle aforesaid.

The left auricle of the left fœtus communicated by a round hole with the right auricle of the right fœtus; it also communicated by a hole above the former, with the middle auricle. The same left auricle had also an osteum venosum communicating with its left ventricle; from which left ventricle proceeds the aorta of the left fœtus.

In front of the middle auricle was a middle ventricle, which sent off the pulmonary artery of the left fœtus, and also communicated with the middle auricle, and by a lateral opening with the ventricle of the right fœtus.

The summary of this arrangement is, that the three auricles communicated with each other, and the middle auricle communicated with the three ventricles, so that notwithstanding the complexity of the arrangement, the circulation was kept up. The middle ventricle, we infer, corresponded with the right ventricle of the left subject, inasmuch as it sent off the pulmonary artery of the left subject.

The thorax had three cavities—one for the right fœtus, a second belonging to the left fœtus, and a third cavity, behind and below the heart, belonging equally to the two fœtuses. There was consequently a right and a left lung as usual, and a third lung in the third cavity, which lung had five lobes, and arose therefore evidently from the coalition of the two adjacent lungs of the different fœtuses. The thorax was separated from the abdomen by a diaphragm. The cavity of the abdomen was single, but a disposition to duplicity was manifested in several of its organs.

The liver being one body, was convex on its upper side, and looked like a single organ, but on its under surface, the blending of two livers was perceptible in the increased number of its lobes, and also by there being on its middle a double gall-bladder, with a common duct from it, which duct terminated in two orifices, one for each duodenum.

There were two stomachs, one on the right, and the other on the left, having their pyloric orifices pointed towards each other. There were also

two intestinal canals; from each stomach proceeded a line of small intestine which was continued through the duodenum, jejunum, and the upper half of the ileum. These two lines adhered laterally to each other like a double-barreled gun, the adhesion being at the upper end of the duodenum and continuing to the lower end of the jejunum; the two intestinal tubes then separated, and continued so one-half way down the ilea—afterwards they adhered laterally for two or three inches, and then blended into a single tube which terminated in the colon, in the right iliac region. From the single tube of the ilium a short diverticulum arose, so as to exhibit again an effort at a double canal.

The colon was single, was properly formed, and exhibited a peculiarity only in being much longer than usual, perhaps twice the natural length.

There were two pancreases, and but one spleen, which adhered to the larger end of the left stomach. There were two kidneys and they were unusually large, one being for the right foetus and the other for the left; they had their corresponding capsulae renales, and between the two latter existed a third. There were two abdominal aortas, one for each foetus, which descended between the kidneys and the two spines. These aortas became a common trunk above the pelvis; this trunk divided almost immediately into two branches of which the left was by much the most considerable. The right branch being small, went only to the right side of the pelvis and the corresponding lower extremity, while the left branch, besides supplying the corresponding side of the pelvis, and lower extremity, was continued in a large trunk as the umbilical artery. This umbilical artery was the only one belonging to the umbilical cord. There was but one urinary bladder.

The organs of generation were single, and exhibited no disposition to duplicity."

The skeleton is handsomely mounted and preserved in the Anatomical Museum of the University of Pennsylvania in the city of Philadelphia.

CASE 75. *Dicephalus dibrachius dipus*. FIG. 59.

[S. BROMILOW. *Edin. Med. and Surg. Journ.*, vol. 55, p. 435, Pl. X, Apr., 1841.]

Male, at full term, born Feb. 20th, 1840, in Liverpool, Eng., the product of first pregnancy; still born; natural labor, head presentation.

Two well developed heads, two necks, one body, two upper and two lower extremities.

A third or intermediate clavicle attached to top of sternum, free at the scapular extremity. Heart about one-third larger than the usual size; no proper apex; two cavities only; the auricle situated at the superior part and between the two aortas, the large ventricle occupying the whole of the body of the heart; the orifices guarded by the usual valves.

"From the left portion arises an *aorta ascendens*, which gives off the right and left carotid, then forming a curvature or arch, from which arises the left subclavian, and terminating in the *aorta descendens*, which crosses over the spines to the right side of the vertebrae. Immediately below the aorta arises the pulmonary artery, which goes to the left lungs; the *ductus arteriosus* passes nearly at right angles from it to the arch of the aorta. Another *aorta ascendens* arises from the right portion of the heart, which divides into the right and left carotid and right subclavian. About the part where the arch and descending aorta commences, only a small artery is given off, which goes to the right lungs. The *vena cava superior* is formed by the junction of the left jugular of the right neck, and right jugular of the left neck; a little lower down the right and left subclavians enter. The other jugulars enter into the subclavian veins. The *vena cava inferior* runs the usual course, terminating at the posterior part of the auricle.

Fig. 59, *a*, the auricle; *b*, the *vena cava superior*; *c*, the pulmonary vein; *d*, the right aorta, giving off a right and left carotid and subclavian, from which a small artery (*e*,) goes to the right lungs; *f*, the arch of the left aorta, giving off a right and left carotid and left subclavian; *g*, the pulmonary artery; *h*, the *aorta descendens*; *i*, the *ductus arteriosus*.

The lungs in each cavity of the chest are subdivided into three lobes

The pneumogastric nerves from each head and neck have the usual distribution to the larynxes, lungs, heart, and stomachs, except at their entrance into the thorax, the external ones passing anterior to the subclavian arteries, and posterior to the axillary veins; and the internal ones passing along the carotid and posterior to the subclavian veins; the one from the right neck going to the right lung, and the one from the left to the left lung.

There are two œsophagi, two stomachs, and two duodenums, the right duodenum entering into the left about its middle; the remainder of the intestinal canal being single. The rest of the viscera were natural. From each head there is a perfect spinal cord and canal to about the third lumbar vertebra, where the canals and cords unite."

CASE 76. *Dicephalus dibrachius dipus*.

[G. J. FISH-R. *American Med. Monthly*, vol. VIII, p. 229, 1857. Woodcut.]

Mrs. L., of Sing Sing, N. Y., aged 36 years, in her ninth accouchement, was delivered of the subject of this case, under my attendance, Aug 11th, 1857. Female fœtus, sixth month of gestation. Two hydrocephalic heads of equal size, on separate necks. One broad-chested body, two upper and two lower extremities. One umbilicus.

The heart was large, resulting from the coalition of two. A single aorta, a double set of carotids. Two tracheas; two pairs of lungs; the larger pair, occupying the anterior portion of the thorax, consisted of the right lung of one fœtus and the left of the other. The imperfectly developed lungs were fused and occupied the median and posterior portion of the chest, and of course also consisted of one incompletely developed lung from each half of the compound body. A broad diaphragm separated the chest from the abdomen. The livers were fused in one mass. The stomach was nearly globular, with a right and left fundus, which resulted from the fusion of two stomachs; an œsophagus from each mouth; both entered this compound stomach nearly at the same point, at its upper and central portion; intestines single throughout. One kidney only which was situated in the right lumbar region; with this exception but one set of genito-urinary organs existed.

Two complete vertebral columns, converging from above downward, were in contact, but not fused, by the margins of the sacrum. To the dorsal range of each spine twenty-four ribs were attached, the external series united anteriorly to a well formed sternum, the posterior and intermediate series, which were very short, were united at their distal extremities, with no sternal rudiments intervening. The junction of these inner ribs formed a prominence or ridge, which partially divided the chest into two thoracic cavities. No trace of rudimentary upper or lower median extremities could be found. Two scapulas and two clavicles. I could discover no abnormalities which would have prevented the continuance of life had the fœtus reached the full term and survived its birth.*

CASE 77. *Dicephalus dibrachius dipus*.

[PROCHASKA, *Adnotat. academ. Fasc. I*, s. 47, *Taf. I*. FÖRSTER, *op. cit. Tafel VI, Fig. 1.*]

* The present monograph is the result of an interest in the subject which was first excited by the above case.

The subject was a male, the right head was very much larger than the left, in consequence of being hydrocephalic. The first dorsal vertebræ of each spine were separated one inch apart, the eighth touched by their transverse processes, the remainder by their bodies, which became so much fused that the lumbar range had a common canal; the sacrum was single. The spinal cords were confluent opposite and below the fourth lumbar vertebra. The vagus and sympathetic nerves were separate above and united below. The arrangement of the ribs was the same as in my case, (CASE 76,) except that two small bones were found at the upper and median portion of the chest, which were probably rudimentary scapulæ and clavicles. The chest was divided into two cavities, each with a mediastinum, a pair of lungs, and a heart enclosed in a pericardium of its own. The left heart was the largest, the vessels from which were normal. The septa of the right heart were very defective. The two aortas united in one trunk at the seventh dorsal vertebræ. Scrotum in front of an imperforate penis; testes in the abdomen; the seminal ducts terminated in the bladder near the ureters. One compound liver with two gall cysts; one spleen, which was the left. The alimentary canals as low as the duodenums were double, at which point they were fused in a single tube. The colon ended blind at the superior strait of the pelvis; no rectum or anus. Kidneys, ureters, and supra-renal capsules normal in structure, there was but a single pair.

CASE 78. *Dicephalus dibrachius dipus*.

[“A Dicephalous Monster with one head black and the other white.” M. PRUS. *L'Union Medicale*, 1848. Quoted in the *London Med. Gazette*, and from the latter in the *N. Y. Journ. of Med. and the Collateral Sciences. Sec. series, Vol. I, p. 420, Nov., 1848.*]

“M. Prus has recently addressed to the Medical Society of Paris, a communication on a singular case of monstrosity, which occurred at Alexandria. The monster, which was born dead, had two heads attached to one trunk. The heads were well formed; one was white and appeared to correspond to about the eighth month of uterine life; the other was black, of larger size, and had apparently reached maturity. In other respects, the child, which was a male, was normally developed. The shoulders, trunk, and upper and lower extremities were white. The nails were imperfectly formed, and resembled those of an immature child. The alteration in the color of the skin commenced about the level of the neck of the black head. It was here brown, becoming gradually deeper, and passing imperceptibly to a deep black, extending over the whole of the head and face. M. Prus made a careful examination, and satisfied himself that the change of color was not owing to any nævus, sanguineous congestion, or other morbid condition. When the epidermis was removed, there was a thick layer of pigmentum nigrum in the mucous tissue of the skin. He therefore referred this head to the negro type—an inference which was justified by its form and general aspect. The parents were *fellahs*—the mother was from twenty-five to thirty years of age; and the father about thirty, a laborer in the port of Alexandria. Like all individuals of this tribe, they had a brown skin, with a yellowish tint. The woman died soon after delivery. She had previously had five well formed children, of whom four had been born dead.”

The following remarks are quoted for the purpose of commenting upon the erroneous inferences to which they are calculated to lead:

“The physiological questions which arise in respect to this monster are difficult of solution. Did the two heads belong to different types, *fellah* and negro? Is it a case of superfœtation in which two ova have been separately fecundated, the one by a negro, and the other by a white; the

ova becoming fused with the exception of the two heads? If this were the case, it is difficult to understand why some portion of the skin of the trunk and extremities should not have been equally black. M. Prus remarks that there are negro laborers in the port of Alexandria, but he could not ascertain whether the mother had had intercourse with one of that race. A committee has been appointed by the Society, to draw up a report upon this very remarkable case."

I have been unable to ascertain the result of the committee's investigation, or whether any report was ever made to the Society.

This is not the place for the discussion of questions relating to the origin and embryology of double monsters; it properly belongs to another section of the work, and I will therefore merely allude in the most general terms to a few facts which will serve to correct any erroneous views which the reader, if unacquainted with the subject, would be likely to form on reading the above quotation.

Double monsters are not the product of a fusion of two ova, or of two embryos, even in a double yolked egg. They invariably result from the development of two more or less complete germs in a single ovum. It is no more rational to suppose such an ovum to be fecundated by two males, either of the same or of different races, than it is to suppose that a single ovum which develops a single germ, and a single foetus, may be the product of double fecundation, by two males, and that each of the bilateral halves of the foetus shall possess the distinctive characteristics of two national types.

Without attempting to explain the curious phenomenon of the diversity in color in the two heads, I will merely suggest that it may have been one of those rare cases of congenital *nigritism*, or *melanopathia*, an affection of the skin which is characterized by an augmentation of black pigment, which is generally deposited in patches of variable extent. The parents are said to have had "a brown skin, with a yellowish tint;" the white portion of the foetus may have approached albinism, while the black head may have been merely an intensification of the natural color.

CASES 79 AND 80. *Dicephalus dibrachius dipus*.

The two following cases have not been reported, to my knowledge, in any journal or medical work. They are the only ones, in the human subject, that I have found in the Anatomical Museums of this country which have not been reported. They are similar in all respects to the cases above described:

One is in the *Anatomical Museum of the University of Pennsylvania*, in Philadelphia—labeled No. 32. (No. 209, 5, A). Presented by Dr. Haywood, of Connecticut, in 1826.

The other is in the *Anatomical Museum of Harvard University Medical School*, Boston, Mass. Preparation No. 375.

CASE 81. *Dicephalus dibrachius dipus* vel *Dicephalus tetrascelus*.* FIGS. 64, 65.

[G. VAN DOEVEREN. *Specimen Observationum Academicarum, ad Monstro-*

* From τετρα, 'four' and σκελος, 'leg.'

rum Historiam, etc. Groningæ et Lugd. Batav., 1765, quarto. Tab. I-IV, p. 1-46.]

This case is introduced to illustrate the internal structure and bilateral symmetry, exhibited in a lamb, which was dissected by Van Doeveren in 1760, and described minutely in the above cited work, which also contains four admirable plates, the first and fourth of which I have had reduced and engraved on stone. [Figs. 64 and 65.]

Fig. 64 represents the animal with the thorax laid open; *a*, the common diaphragm; *b*, a semilunar muscle, resulting from the fusion of two levatores scapulæ; *c, c, c, c*, four sterno-mastoid muscles; *d, d, d, d*, four sterno-hyoid muscles; *e, e*, right and left trachea; *f*, single heart; *g, g*, lungs collapsed; *h*, arch of the aorta; *i*, pulmonary artery; *k*, ductus arteriosus; *l*, left auricle; *m*, an aorta to the right; *n*, right carotid artery from ditto; *o*, vena cava superior; *p, p*, right and left jugular veins.

Fig. 65 illustrates the law of homologous union of the bilateral portions of a double monster, as seen in the junction of the spinous processes and vertebral laminae of the dorsal ranges, and the coalition of the bodies of the lumbar vertebrae. In Van Doeveren's fourth plate, figure first, which represents the anterior aspect of the double vertebral column, the bodies of all the vertebrae are seen to consist of a right and left portion, which are separated by a superficial groove; the lateral halves of the sacrum are, however, so perfectly fused as to appear like one solid bone, as in the normal sacrum of a single body.

The dicephalous monster is not very rare among the lower animals. Two-headed calves, lambs, snakes, &c., are to be seen in many of the Anatomical, and in some of the General Museums of almost every country. I have selected a few examples from several varieties of animals as illustrations, most of which I have personally examined.

CASE 82. *Dicephalus tetrascelus*. (Lamb.)

Alcoholic preparation No. 36, in the Anatomical Museum of the University of Pennsylvania, Phil'a., is a dicephalous foetal lamb, the heads and necks of which are symmetrically developed; the body single, two anterior and two posterior extremities.

CASE 83. *Dicephalus tetrascelus*. (Sheep.)

[CONANT. *American Medical Times*, Vol. VI, p. 138. N. Y., 1862.]

At a meeting of the N. Y. Pathological Society (Nov. 26, 1862), Dr. Conant stated that the Museum of the Medical School of the State of Maine contained the skeleton of a double-headed sheep, which had arrived at adult age. The three anterior cervical vertebrae of each neck were separate; the fourth was double, and had two vertebral foramina for the transmission of the two spinal cords; posterior to this, the vertebrae were more intimately fused, the spinal canal being single.

CASE 84. *Dicephalus tetrascelus*. (Calf.)

The principal portion of the skeleton of this double-headed calf is preserved in the Museum of the Medical Department of Harvard University. (Specimen not numbered.)

The skulls are equal and perfect. The vertebral columns are separate and distinct, but lying in juxtaposition as low as the fourth lumbar vertebrae; the fifth and sixth are ossifically fused at the bodies, but the spinous processes are distinct. Five or six of the dorsal spinous processes of each column are fused in such a manner as to constitute a continuous bony ridge. The sacra are laterally coalesced. No rudiment of median anterior extremities exists. The heart is compound. Two anterior and two posterior extremities.

CASE 85. *Dicephalus tetrascelus*. (Colt.)

This case was related to me by my friend Dr. Daniel Clark, of Franklin, Delaware Co., N. Y. Dr. Clark states "My friend, and neighbor, (at that date,) Dr. Adams, of Smithville Flats, Chenango Co., N. Y., in the spring of 1829, assisted the delivery of a mare, which foaled a two-headed colt. The delivery was effected with much difficulty, and was only accomplished by cutting off one of the heads. The colt had reached the full period of intra-uterine development, the heads were symmetrical; two front and two hind legs.

CASE 86. *Dicephalus tetrascelus*. (Mouse.)

Prof. J. B. S. Jackson, of Boston, informed me that he saw in the Museum connected with the Hospital at Hallæ, a mouse with two heads. This fact is recorded in his Mss. notes of interesting objects which he saw in European Museums.

CASE 87. *Dicephalus dipus*. (Pigeons.)

Two cases of double headed pigeons are figured and described in the *Mémoires de L'Académie des Sciences* for 1734.

CASE 88. *Dicephalous Dog-Fish*.

Museum of the Dublin College of Surgeons. *J. B. S. Jackson's Mss. Notes*.

CASE 89. *Dicephalous Dog-Fish*.

[ORPEN. (London) *Lancet*, Vol. I, 1845, p. 224.]

This "biformed dog-fish" was taken at, or near, the Cape of Good Hope, in 1843, by Mr. Orpen, and sent to his father, Dr. Orpen of Birkenhead, Cheshire, England. It is a very young one. No special description accompanied the three drawings which Dr. Orpen sent to the editor of the *Lancet*.

CASE 90. *Dicephalous Shark*.

[Museum of the Naples University. *J. B. S. Jackson's Mss. Memoranda*.]

CASE 91. *Dicephalous Shark*.

This specimen is preserved in the Fort Pitt Museum, Chatham, England. Prep. No. 2,734. It is three and a half inches long. [*Ibid.*]

CASE 92. *Dicephalous Snake*.

This specimen was shown to me by Prof. Leidy, who says it was found near Philadelphia. The snake, (species not ascertained) was about half grown. The heads were equally perfect, and entirely separate from each other, the bifurcation of the body extended but a few lines back of the head.

CASE 93. *Dicephalous Snake*.

[CONANT. *Am. Med. Times*, N. Y., 1862. Vol. VI, p. 138.]

Dr. Conant, at a meeting of the N. Y. Pathological Society (Nov. 26, 1862), presented a small double-headed snake, which was found in a field in the State of Maine. No description or further account of it was given.

CASE 94. *Dicephalous Snake*.

[*Desc. Cat.*, Boston Soc. Med. Imp., p. 311.]

Prep. No. 856. A small double-headed snake, from South America. The two heads appear to be about equally developed, and form with each other a right angle as in the following case from St. Hilaire:

CASE 95. *Dicephalous Snake*.

[IS. GEOFF. ST. HILAIRE. *Hist. des Anomalies de l'Organisation*, etc. Tome III, p. 193. *Atlas*. Pl. XV, fig. 2.]

A viper with two symmetrical heads. The Atlas was double, having two foramina magna.

[F.]

This is a rare form; it is denominated *Atlodymus* by Is. Geoff. St. Hilaire.

It properly belongs, in my classification, to the subgenus *Dicephalus monauchenos*, or one-necked double-headed monster, but the more minute details of classification are unimportant, and do not require to be strictly adhered to.

CASE 96. *Dicephalous Snake.*

This is a case which Prof. J. Wyman allowed me to examine, and which is preserved in his Museum of Comparative Anatomy, at Harvard University, Cambridge, Mass. It is a young water snake, *Tropidonotus sipedon*, about six or seven inches in length, which was found near Boston. The necks are distinct for a little more than an inch back of the heads. The dorsal markings are seen to be double, but fused for more than an inch back of the bifurcation; beyond which point they are apparently single.

CASE 97. *Dicephalous Snake.*

Prof. J. Wyman informed me that he saw a living serpent with two heads, in the *Jardin des Plantes*, in Paris, in the year 1853. It could use either of its heads, eating with one as readily as with the other. The Professor was unable to state the exact species to which it belonged. It was an adult.

CASE 98. *Dicephalous Snake.*

[SAM. L. MITCHELL, *Silliman's American Journal of Science and Art*, Vol. X, p. 48, 1825, "On two-headed serpents."]

"During the year 1823 a female snake was killed, about six miles west of the Genesee River, (N. Y.), together with her whole brood of young ones, amounting to *one hundred and twenty*. Of these, three were monsters; one with two distinct heads; one with a double head, and only three eyes; and one with a double skull, furnished with three eyes, and a single lower jaw; this last had two bodies."

The paper is illustrated with three wood-cuts.

The first belongs to the genus *Dicephalus*, the two latter to the genus *Diprosopus*.

CASE 99. *Dicephalous Snake.*

ED. BANCROFT, in his "*Natural History of Guiana*," incidentally refers to a double-headed snake found near Lake Champlain, in the State of New York.

CASE 100. *Dicephalous Tortoise.*

[SAM. L. MITCHELL, "On two-headed serpents." *Op cit.*]

Prof. Mitchell, in the article above cited, alludes to a "two-headed tortoise" which took its food with equal facility by either or both mouths.

I have had an opportunity to inspect this identical specimen, June 9th, 1864, at the American Museum, (Barnum's, since destroyed by fire,) the label stated that it was "presented by Dr. Mitchell, who possessed it when it was living."

It not only had two equal and well formed heads, but duplicity could be seen in the shell, the anterior third of which was broader than in the single animal, and had two sets of plates. The dorsal ridge was bifurcated at the junction of the middle and anterior thirds; the angle of divergence from this point was about 76° . The dorsal, lateral, and marginal plates were duplicated, and modified correspondingly.

CASE 101. *Dicephalous Earth-Worm.*

Prof. J. B. S. Jackson notes having seen a bifid earth-worm in the Museum of the London College of Surgeons. *Mss. memoranda.*

A case of "Forked Earth-Worm" is reported by Dr. Asa Fitch, in the *Trans. of the N. Y. State Agricultural Society*, vol. XXII, 1862, p. 691.

This was not dicephalous. "It is a young worm about three inches long, having the hind end of its body forked or divided into two branches nearly a fourth of its length. The forks are cylindrical, of equal length and thickness, and about a third less in diameter than the body forward of them. When it was first taken in the hand both forks were noticed to discharge their earthy fœces alike."

This last case properly belongs to another section of this work.

Sub-species II. Dicephalus monauchenos.

This is an extremely rare variety of dicephalus, so much so that only two or three examples of it have ever been recorded. It differs from the other varieties of the genus in having two separate heads on a single neck. The body and extremities are the same as in a single individual. The neck, though externally single, contains two more or less complete cervical ranges of vertebrae.

CASE 102. *Dicephalus monauchenos.* FIG. 63.

[WHITE, *Dublin Medical Press*, 1839, vol. 1, p. 212, quoted by W. Montgomery, in *The Dublin Quarterly Journ. of Med. Sci.*, vol. XV, 1853, p. 264, Pl. 2, fig. 1. "Double-Headed Fœtus.—Carlow Case.")]

March 3rd, 1839. Dr. White was called to a woman in labor of her eighth child, and found the lower extremities and nates of a female child already protruded. In trying to bring down the arms, he was surprised to feel two mouths and noses, and a division in the neck, into which his finger readily passed.

It was found impracticable to effect the delivery of the heads by manipulation; and as symptoms became pressing, Dr. White introduced the perforator through the palate, and having reduced the size of the head, he fixed a hook in the foramen magnum, and, with the assistance of Dr. Porter, extracted the double-headed child. There supervened so much hemorrhage, that manual removal of the placenta became necessary; after which the uterus contracted favorably.

The child appeared to be at the full time, and rather larger than usual. About the fourth or fifth cervical vertebra, the neck was divided into two, each supporting a well formed head; these were considerably flattened where they touched, and the ears there placed were rather larger than those outside. The heads were otherwise well formed. The chest and abdomen were larger than usual, and on the back the spinous processes of two vertebral columns could be distinctly traced, gradually approximating towards the sacrum; and there was a sharp spine of bone, almost bursting through the skin, growing from the right side of the sacrum.

The measurements of the monster were as follows:—length of child, 18½ inches; breadth across the shoulders, 7; breadth across the heads, 8; length of arm, 8; girth of lower part of chest, 14.

The child was buried unexamined, but was exhumed twelve days afterwards, and examined, but not satisfactorily. The following particulars were, however, ascertained. There was but a single pair of lungs, of the usual size, and placed rather posteriorly, the heart encroaching much on their position. The latter organ was very large; two auricles; three ventricles, one in the center, and behind the other two; from this arose the pulmonary artery, and from each of the two anterior ventricles arose an artery. That from the right subdivided into three, which were distributed to the right head and arm,—that from the left gave off three branches for the left head and arm; its continued trunk appeared to be the aorta, and to supply the remainder of the body. In short, says Dr. White, it seemed as if to a normal heart, intended to supply the left head and body, an ad-

ditional ventricle was superadded for the right head and arm.* The two anterior ventricles appeared to communicate through their septum. Behind the heart, contained within a serous sac, was a fleshy mass, in shape something like the spleen, but of the color of the heart; in texture, it was like a hepatized lung; it had no cavity in it."

This was without doubt rudimentary pulmonary tissue.

"An œsophagus was traced from each pharynx; the left one was in its usual place, and the right one more anterior, and to the right of the bodies of the vertebræ belonging to the right head and body; each œsophagus terminated in a distinct stomach. The left stomach was in its usual position, the right one reversed, its large extremity towards the right. The two stomachs united at the pylorus, and opened into a common duodenum, and from thence downwards the intestinal canal was single. The liver was enormously large, as was also the colon; the bladder and uterus single; the bodies of two separate spinal columns could be felt through the chest and abdomen to the sacrum, with a space between them, into which a large quill could be laid."†

CASE 103. *Dicephalus monauchenos*.

[Asch's Zeichnungen, No. 10.]

Two distinct and separate heads on a neck almost entirely single. Both heads were derencephalic or acranial. Female foetus.

CASE 104. *Dicephalus monauchenos*.

[KOLLER. *Wien Wochenschr.* Nr. 46, 1856.]

Literature of Dicephalus dibrachius dipus. Gruber, *Anat. eines Monstr. Bicorp.* Prague, 1844. J. B. S. Jackson, *Cat. Anat. Mus. Boston Soc. Med. Imp.* 1847, p. 309. *Prep.* No. 850, *Pl. X. Fig.* 25. G. Pfeiffer, *Am. Jr. Med. Sci. N. S.*, vol. XII, p. 80, 1846. W. E. Horner, *Ibid.* O. S., vol. VIII, p. 349, *Pl. III*, 1831. S. Bromilow, *Edinburgh Med. & Surg. Journ.*, vol. 55, p. 435, *Pl. X*, Apr. 1841. G. J. Fisher, *American Medical Monthly*, vol. VIII, p. 229, 1857. Prochaska, *Adnotat. Academ. Fasc. I*, s. 47, *Taf. I*. Prus, *L'Union Medicale*, 1848, quoted in *Lond. Med. Gazette*, 1848, and *N. Y. Journ. of Med. & Coll. Sci., Sec. Series*, vol. I, p. 420, Nov. 1848. Van Doeveren, *Spec. Obs. Acad. ad. Monst. Hist., etc., Groningae et Lugd. Batav.*, 1765, *Tab. I-IV*, p. 1-46. Conant, *Am. Med. Times*, vol. VI, p. 138, *N. York*, 1862. — *Mem. de l'acad. des Sci.*, 1734. Orpen, *Lancet*, *Lond.*, vol. I, 1845, p. 224. J. B. S. Jackson, *op. cit.*, *prep.* No. 856, p. 311. Samuel L. Mitchell, *Silliman's Am. Jr. of Science and Art*, vol. X, p. 48, 1825. Ed. Bancroft, *Nat. Hist. of Guiana*. White, *Dublin Medical Press*, 1839, vol. I, p. 212, quoted by W. Montgomery, in *Dublin Quarterly Jr. of Med. Sci.*, vol. XV, 1853, p. 264, *Pl. 2, fig. 1*, *Asch's Zeichnungen*, Nr. 10. Koller, *Wien Wochenschr.* Nr., 46, 1856. Sandifort, *Museum Anatomicum*, *Taf. CXXI*. Walter, *Mus. anatom.*, No. 1635, No. 2994. Klein, *Meckels' D. Arch. f. Phys.* III, s. 374, 1817. I. Geoff, St. Hilaire, *op. cit.*, *Tom. III*, p. 181. Regnault, *op. cit.*, *Taf.*, 8. Otto, *op. cit.*, Nos. 349, 350. Barkow, *op. cit.*, *Tom.*, I, p. 31. D'Alton, *op. cit.*, No. 12. Laforgue, *Journ. de Toul. Mars*, 1856. (*Schmidt's Jahrb.*, Bd. 96, S., 296.) Fribe, *Miscellanea Curiosa*, 1673, p. 296, *Obs.*, 165. A. Förster, *Die Missbildungen des Menschen*, *Tafel VI*, *figs.* 2, 3. Girard de Cailloux, *Gaz. Med.*, 1859, p. 105. (*Year Book of Med. & Surg.*, 1860, p. 404, *New Sydenham Soc.*)

* If the communication existed between the ventricles, it would virtually reduce the number of ventricles from three to two, and otherwise alter the action, &c., supposed by Dr. White.

† *Dublin Medical Press*, 1839, vol. I, p. 212.

Fig 6



Fig 7

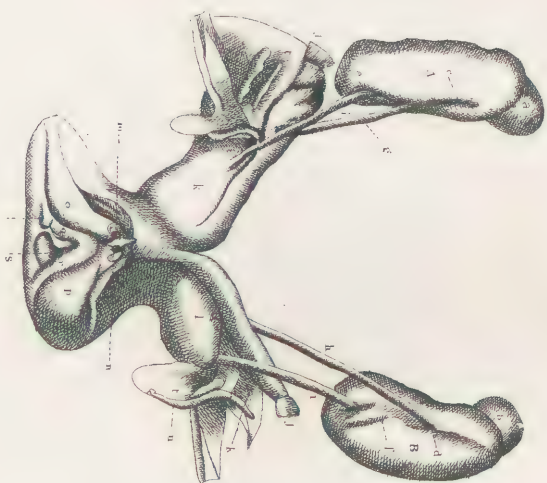


Fig 8

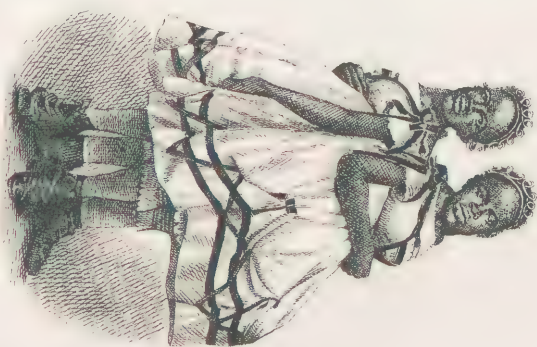


Fig. 10.



Fig. 9.



Fig. 11



Fig. 12

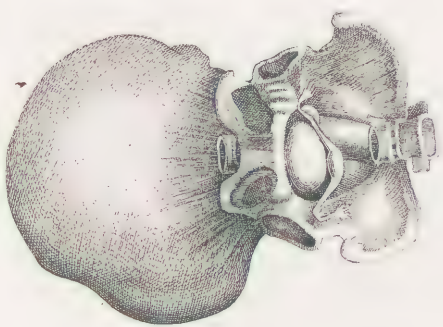


Fig. 13



Fig. 14

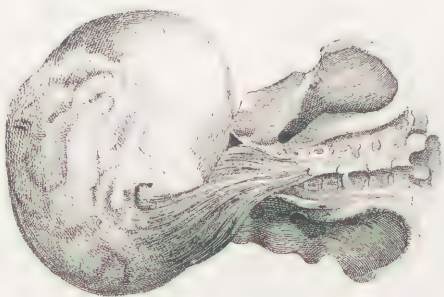


FIG. 15

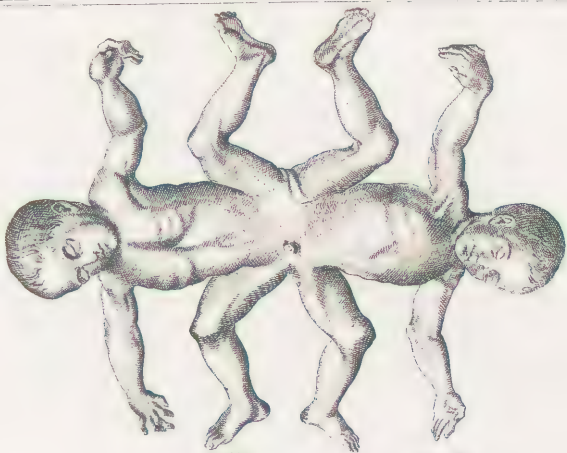


FIG. 16

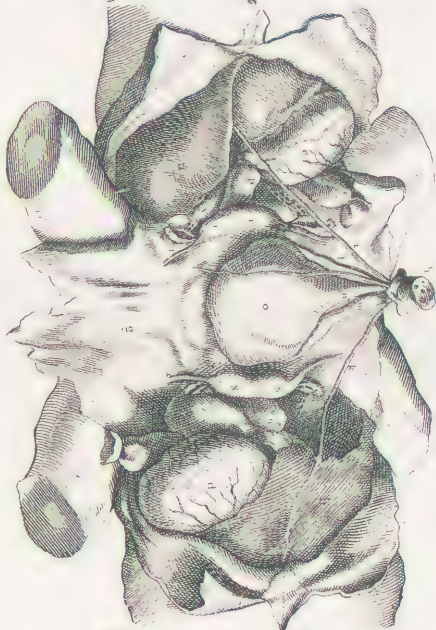


FIG. 17



Fig. 18.

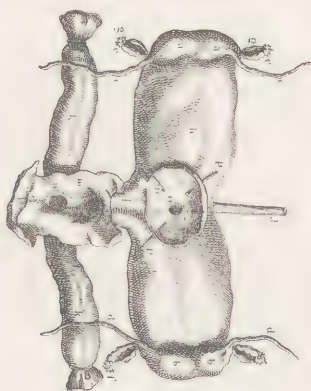


Fig. 19.

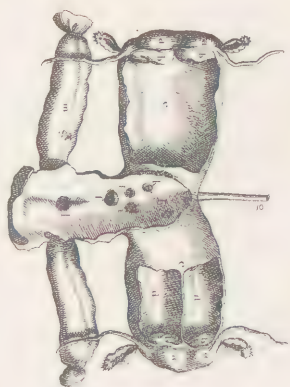


Fig. 20.

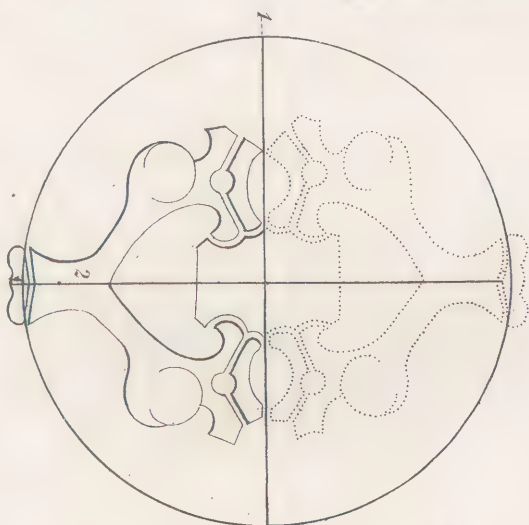


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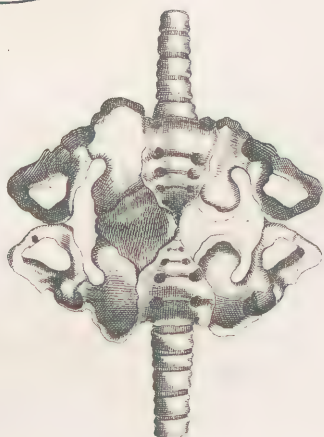


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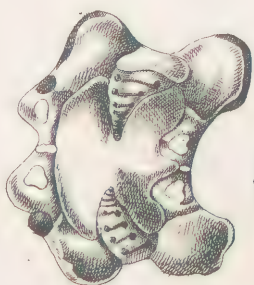


Fig. 23.



Fig. 24.



Fig. 25.



Fig. 26.



Fig 27.



Fig 28.

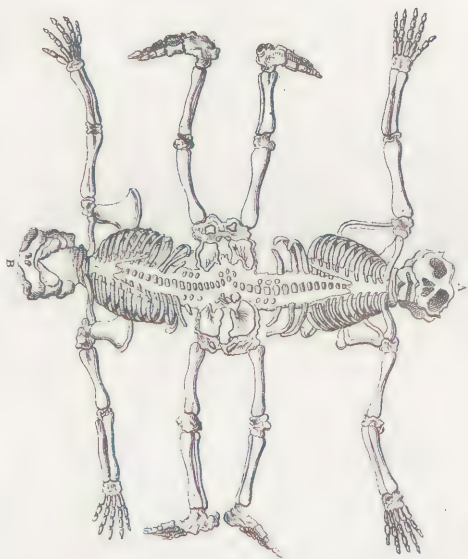


Fig 29



Fig. 30.



Fig. 31.



Fig 32.

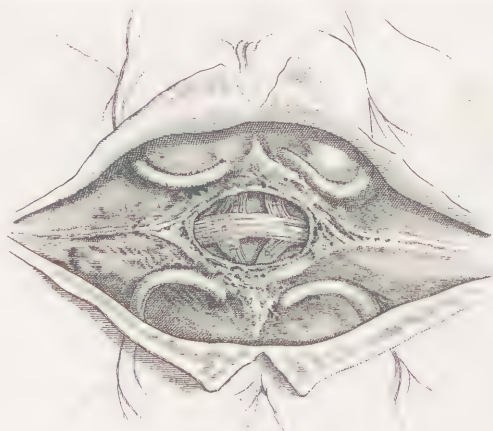


Fig 33.



Fig 34.

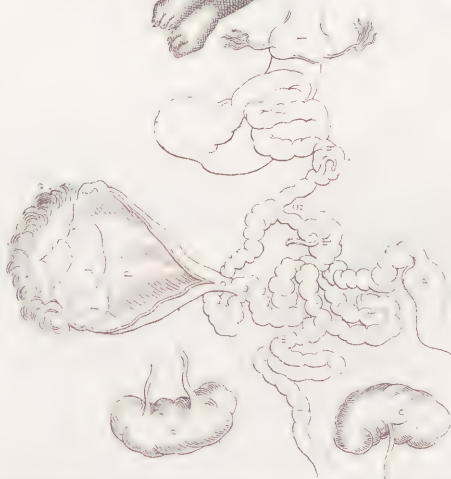


Fig. 35.

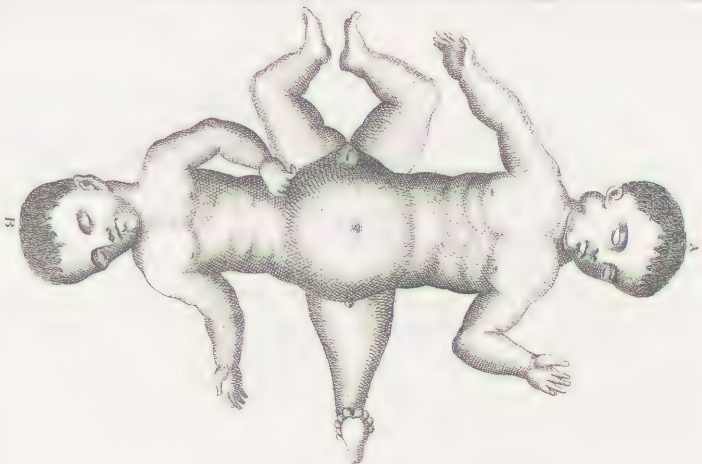


Fig. 36.

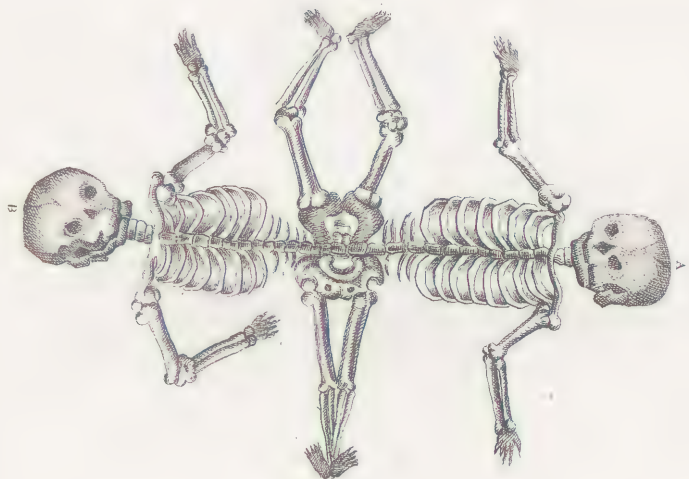


Fig. 37.



Fig. 38.



Fig. 39.



Fig. 40.



Fig.41.

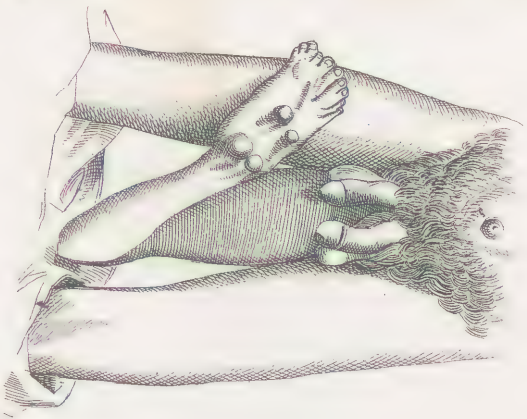


Fig.42.



Fig.43.



Fig 44.



Fig 45.



Fig. 46.



Fig. 47.

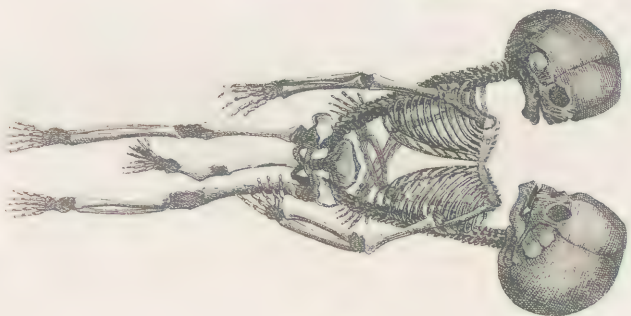


Fig. 48.

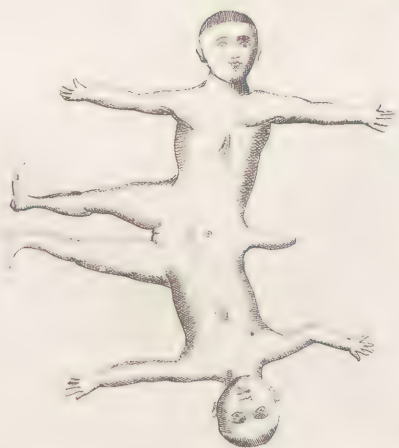


Fig. 49.



Fig. 50.

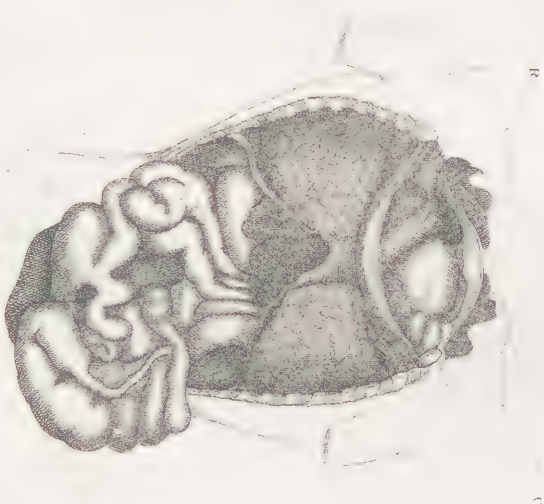


Fig. 51.

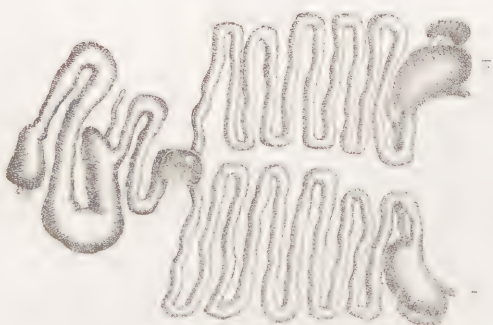


Fig. 52.



Fig. 53.



Fig. 54.



Fig. 55.



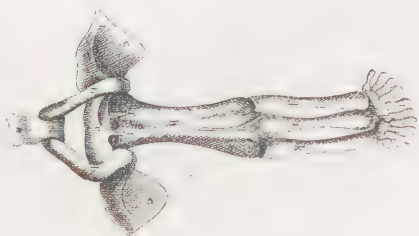
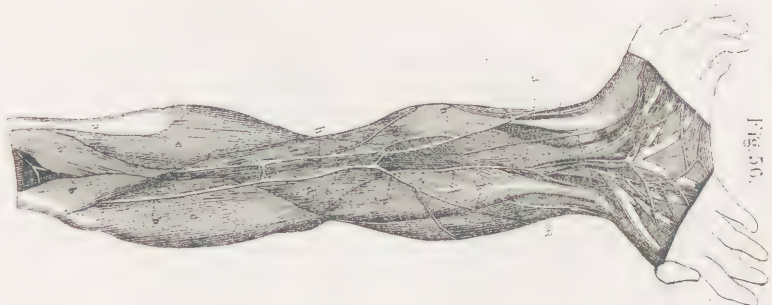




Fig. 60.



Fig. 61.

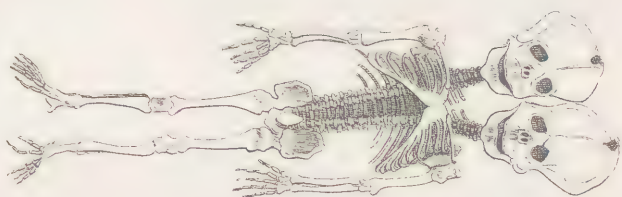


Fig. 62.

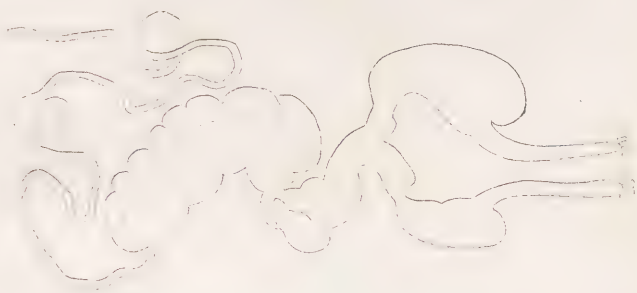


Fig. 63.





Fig. 64.

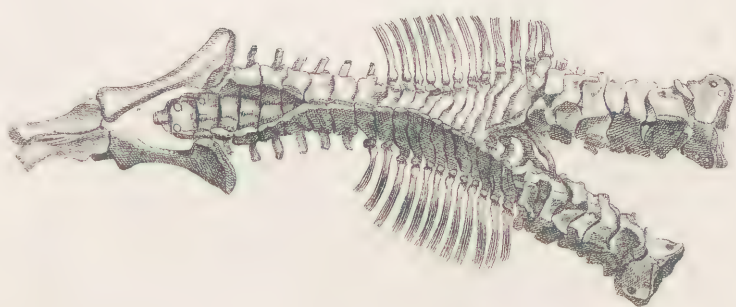


Fig. 65.



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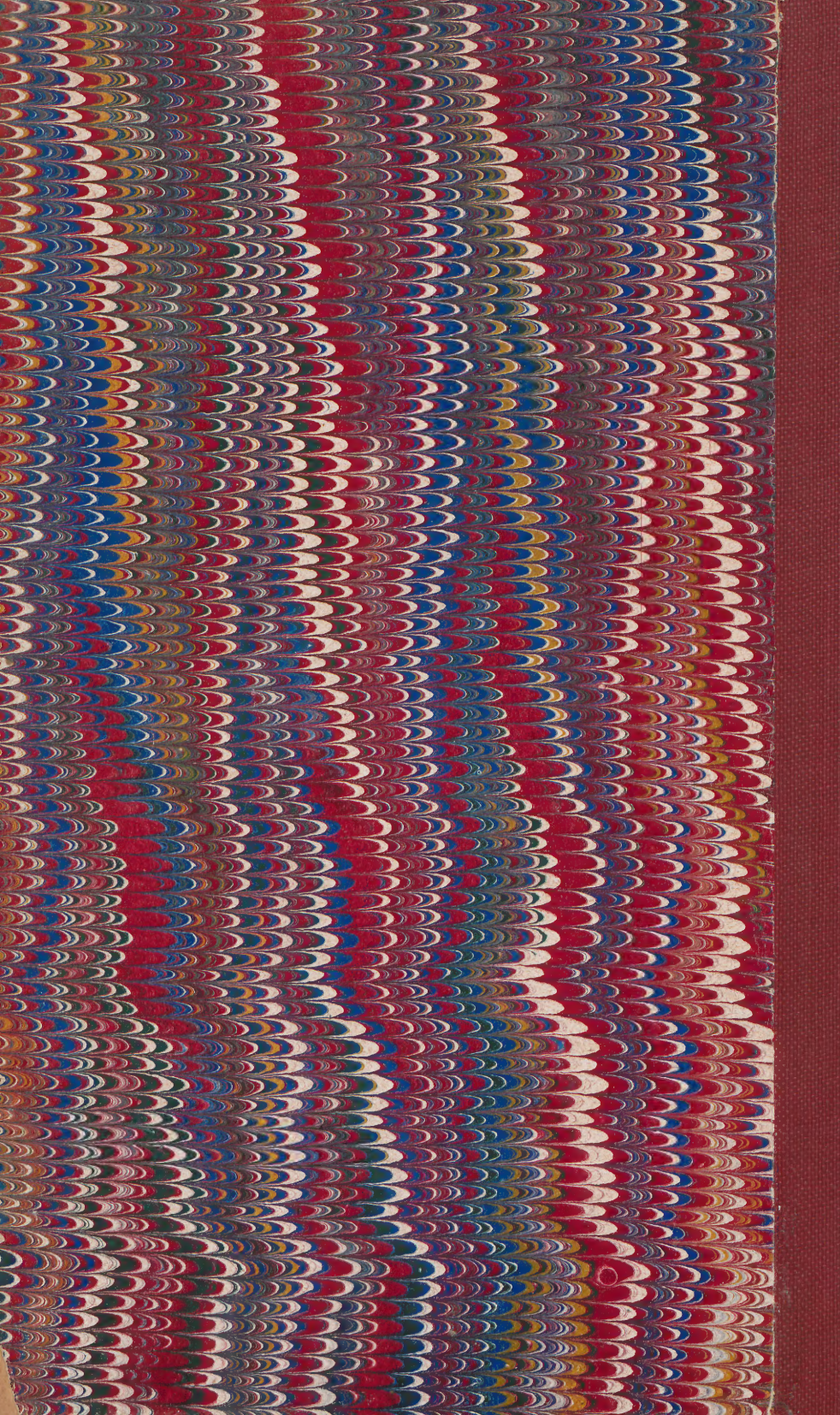
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